eNBSP - NBioBSP

NITGEN&COMPANY Biometric Service Provider SDK

Programmer's Manual C / C++

SDK version 5.0x

INDEX

Chapter 1. Introduction

The eNBSP (NBioBSP) SDK provides feature rich, high-level functionality that can be integrated into any application requiring fingerprint authentication. NBioBSP technology is built on the NBioAPI™ specification, working seamlessly with the most durable, compact, and reliable optics-based fingerprint readers in the world.

All NBioBSP SDK components contain the APIs needed for biometric authentication of multiple users and device functions. NBioBSP is equipped with self-contained User Interfaces for enrollment and verification, enabling software application developers to quickly and easily integrate fingerprint authentication into the application of their choice.(Linux OS can not support UI)

NBioBSP COM Module
NBioBSP COM module based Microsoft COM Technology that facilitates easily integration of NBioBSP by developers using RAD tools or doing web development.

NBioBSP Class Library Module
The NBioBSP Class Library is designed to support developers using C#, VB.NET, ASP.NET, J# and the like in Microsoft .NET environment.

Data Conversion Module
The data conversion module provides some APIs that can be used to convert fingerprint data captured from FDx devices into the data format NBioBSP module uses.   (Support ANSI 378 and ISO 19794-2)

Image Conversion Module
The image conversion module provides some APIs that can be used to convert fingerprint image data to various types of image format.(32bit only)

1. 1 Features

Optimized Graphical User Interface (Windows SDK only)
NBioBSP SDK offers an excellent user interface for acquiring high-quality fingerprint images from NITGEN's advanced fingerprint recognition devices.

Multiple-Fingerprint Enrollment
Each user can enroll up to 10 fingerprints, and one template is used to store all fingerprint data.

Secure Fingerprint Data
All fingerprint data generated by NBioBSP is encrypted with a 128-bit encryption algorithm to protect the template from forgery or tampering by unauthorized users.

Device Independent
NBioBSP supports all of NITGEN's fingerprint recognition devices seamlessly with a common programming approach for all devices.

Self Protection
NBioBSP provides some functions to inform whether the module has been fabricated.

1.2 Support Modules

The core module of NBioBSP SDK is a NBioBSP.DLL. It is built on the NITGEN NBioAPI™. The NBioBSP implements all biometric functions.

NBioBSP (NBioBSP.DLL)
This is the main module of the NBioBSP that implements all of NITGEN's biometric functions including fingerprint enrollment and verification
Linux OS supported libNBioBSP.so.

The chapter 3 describes detail usage of NBioBSP SDK functions using the NBioBSP.dll module.
All individual APIs can be referred on Appendix A NBioAPI Specification.

NBioBSP COM (NBioBSPCOM.DLL)
NBioBSP COM module based Microsoft COM Technology that facilitates easily integration of NBioBSP by developers using RAD tools or doing web development.

Developed based on the NBioBSP module, the NBioBSP COM module runs in higher level than the NBioBSP. When developing web programs, fingerprint data must be handled in text format.

The sample programs provided by the NBioBSP are generated by the NBioBSP COM module, described in the COM manual about VB, Delphi, and web programming.

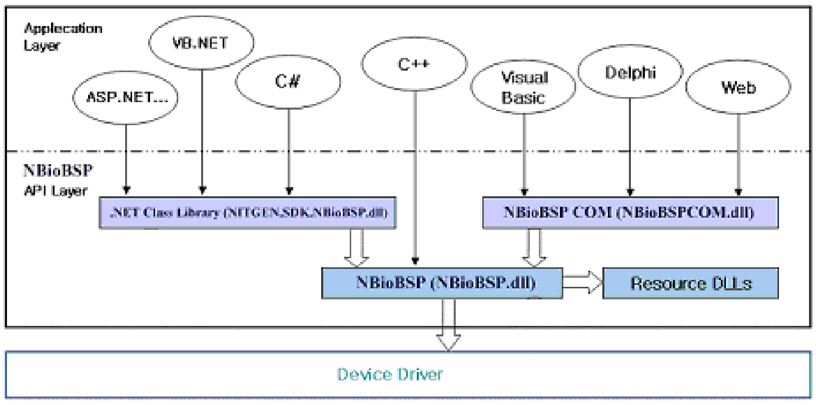
NBioBSP Class Library for Microsoft.NET (NITGEN.SDK.NBioBSP.DLL)
The NBioBSP Class Library (NITGEN.SDK.NBioBSP.dll) is designed to support developers using C#, VB.NET, ASP.NET, J# and the like in Microsoft .NET environment.

The NBioBSP Class Library also uses NBioBSP.dll and provides higher level of interfaces.

NBioBSP Class Library supports almost all NBioBSP functions. Some of C# sample codes included in the NBioBSP SDK are created by using NBioBSP Class Library that is described in detail on .NET manual.

Resource DLL
External resource DLLs can be loaded for additional language support. The default resource is English. NBioBSP SDK provides English and Korean resource files.

The following diagram shows how developers can use modules provided from NBioBSP SDK.



[Development model using NBioBSP SDK]

1.3 Biometric Functions

NBioBSP is based on the NBioAPI specification from NITGEN Co., LTD., and provides an advanced fingerprint authentication model.

NBioAPI is composed of two types of Biometric APIs, namely Primitive APIs and High-level APIs. Most programming requirements are satisfied by high-level APIs, which are generally used for stand-alone type applications (not used for client/server or web environments).

For more complex applications, such as those found in client/server computing environments, primitive APIs may sometimes be required - for example, in an application that captures fingerprint data on the client, but verifies users and stores templates on the server.

1.3.1 Primitive API

Capture

The Capture function is used to capture a fingerprint image from a fingerprint device, and then to extract feature points (minutiae) to form a usable fingerprint template. Multiple samples are captured for the purpose of enrollment (registration), verification, or identification. Once the capturing process is complete, the Capture function returns a Fingerprint Identification Record(FIR) as the result. The application specifies the purpose of the capture operation – enrollment, verification, or identification – this purpose is recorded in the header of the constructed FIR.

Process

The Process function extracts feature points from the captured fingerprint sample for enrollment, verification, or identification. In NBioBSP, the Capture function performs minutiae extraction; for this reason, the Process function is usually not required in the general user enrollment process.

VerifyMatch

The VerifyMatch function matches the newly input FIR against the fingerprint data in a previously stored template FIR; the results of the comparison are returned.

CreateTemplate

The CreateTemplate function processes fingerprint samples to construct an enrollment template FIR, and takes either intermediate or processed FIR as input. The CreateTemplate function can also take an old template FIR to construct a new template FIR, and allows a Payload to be wrapped in the new template FIR.

1.3.2 High-level API

Enroll

The Enroll function is used to extract feature points from captured fingerprint samples using NITGEN fingerprint recognition devices. Enroll can also take an old template FIR to construct a new template FIR, and allows a Payload to be wrapped in the new template FIR.

Verify

The Verify function is used to match a newly captured fingerprint sample against the previously stored template FIR; the results of the comparison are returned. If a Payload is recorded in the header of the stored template FIR, and fingerprint verification is successful, the Payload is also returned.

1.4 FIR

Fingerprint data processed in the NBioBSP is represented in Fingerprint Identification Record (FIR) format. The FIR can include all types of fingerprint data, including raw image, data, or minutiae data.

The FIR is composed of Format, Header, and Fingerprint Data.

Format	**Header**	**Fingerprint Data**
4Byte	20Byte	Variable length

1.4.1 Format

The FIR’s format field indicates the format of the fingerprint data.
The length of the format field is 4 Bytes; header and fingerprint data can be changed depending on format value.

1.4.2 Header

The header is 20 bytes in length and comprises the following fields:

Header Length	**Data Length**	**Version**	**Data Type**	**Purpose**	**Quality**	**Reserved**
4Byte	4Byte	2Byte	2Byte	2Byte	2Byte	4Byte

Header Length

field indicates the size of the Header in bytes.

Data Length

field indicates the size (in bytes) of the fingerprint data in the FIR.

Version

field contains FIR version information.

Data Type

field indicates the type of the fingerprint data stored in the FIR.
There are three types of data, raw data (the original image data), intermediate data, and processed data (minutiae data).

Purpose

field specifies the purpose of the FIR (e.g., enrollment, verification or identification).

Quality

field indicates the quality value of the fingerprint data with a scale of 0 to 100.
Quality field is not supported in this version.

Reserved

field is reserved for later use.

1.4.3 Fingerprint Data

The Fingerprint Data field contains the actual fingerprint data; it has a variable length, and the size of the fingerprint data can be affected by the values in the format field. The size of the fingerprint data is stored in the Data Length field of header.

1.5 Terminology

Template

FIR data used for the purpose enrollment.

Sample

FIR data used for the purpose of verification.

BSP

The Biometric Service Provider is the execution module that interfaces fingerprint devices and fingerprint recognition algorithms with the developer’s application.

NBioBSP

“NITGEN Biometric BSP” is the name of the BSP module provided by NITGEN.

NBioBSP COM

The NBioBSP COM module to support COM interfaces.

NBioBSP Class Library

The NBioBSP .NET module to support .NET interfaces.

Chapter 2. Instaallation

2.1 System Requirements

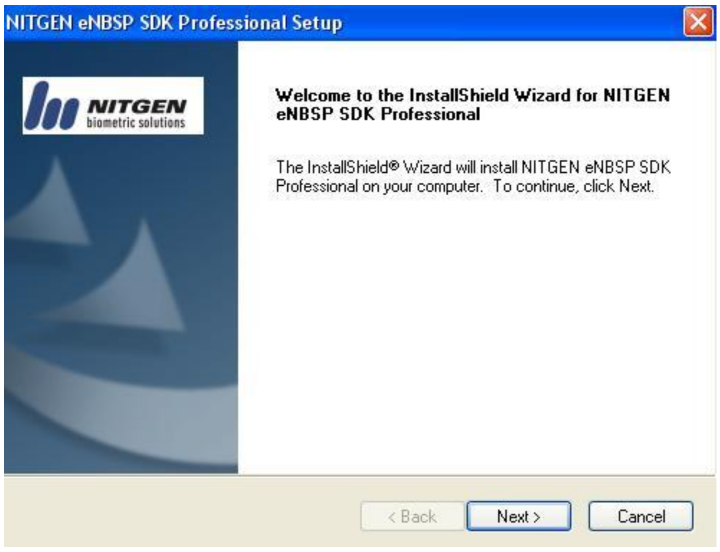
OS:	**XP SP2 or higer / 2003 / VISTA / Windows 7 / 2008**
Linux OS	**Fedora Core 6 or higer (Kernel 2.6.18-1.2798, GCC 4.1.1)**
	RedHat Enterprise 5 or higer(Kernel 2.6.18.1, GCC 4.1.2)
	Open SUSE 10.3 or higer(Kernel 2.6.22.5-31, GCC 4.2.1)
	Debian 4.0 or higer(Kernel 2.6.18-5-686, GCC 4.1.2)
CPU:	**Pentinum processor or later**
Device:	**NITGEN Fingerprint Recognition Device (PC Peripherals)**

SDK supported HFDU 01/04/06, HFDU 01/03/13, HFDU 11/14, HFDU 05/07, HFDU 08/09

2.2 Installation

2.2.1 Windows SDK

1. Insert installation CD into disk drive.
2. Execute Setup.exe file in the root directory of the CD-ROM drive.
3. Read all information displayed in the setup screens, and follow the instructions.
4. Click NEXT to continue.

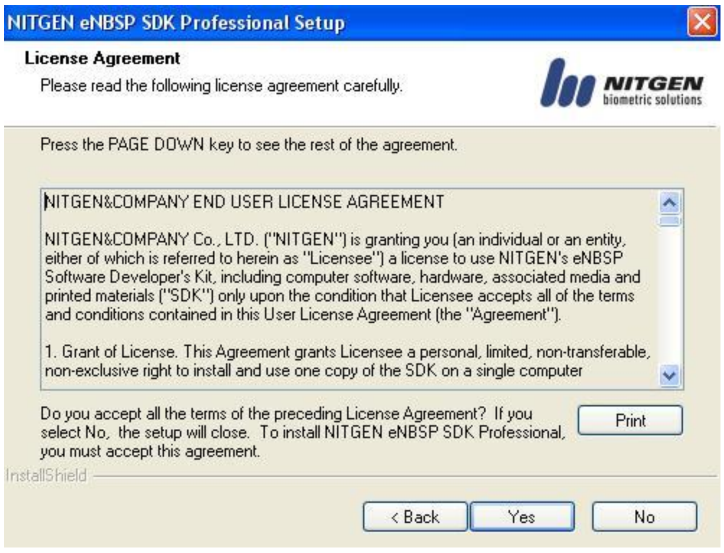


NITGEN eNBSP SDK Professional Setup

Welcome to the InstallShield Wizard for NITGEN eNBSP SDK Professional

The InstallShield® Wizard will install NITGEN eNBSP SDK Professional on your computer. To continue, click Next.

5. Click YES if you agree to the Software License Agreement. If you do not agree, click NO and the installation will be aborted.



NITGEN eNBSP SDK Professional Setup

License Agreement

Please read the following license agreement carefully.

Press the PAGE DOWN key to see the rest of the agreement.

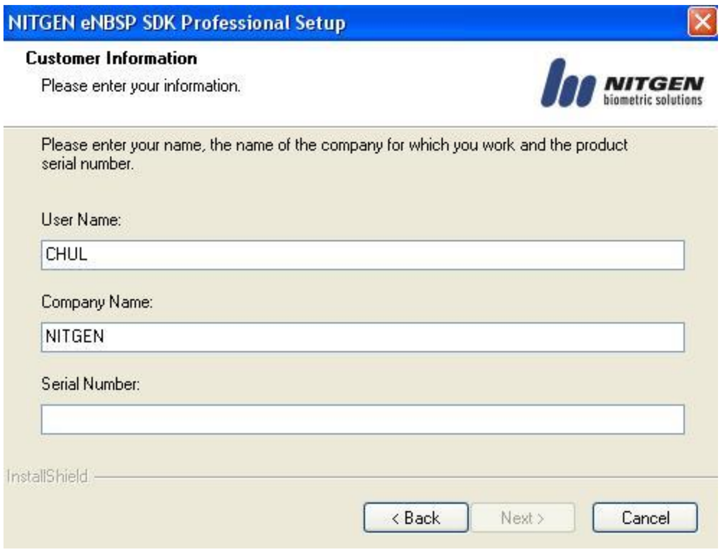
NITGEN&COMPANY END USER LICENSE AGREEMENT

NITGEN&COMPANY Co., LTD. ("NITGEN") is granting you (an individual or an entity, either of which is referred to herein as "Licensee") a license to use NITGEN's eNBSP Software Developer's Kit, including computer software, hardware, associated media and printed materials ("SDK") only upon the condition that Licensee accepts all of the terms and conditions contained in this User License Agreement (the "Agreement").

1. Grant of License. This Agreement grants Licensee a personal, limited, non-transferable, non-exclusive right to install and use one copy of the SDK on a single computer

Do you accept all the terms of the preceding License Agreement? If you select No, the setup will close. To install NITGEN eNBSP SDK Professional, you must accept this agreement.

6. Enter your **name**, **company** and **serial number** listed on the installation CD. If you do not enter a valid serial number, the setup will not continue.


NITGEN eNBSP SDK Professional Setup

Customer Information

Please enter your information.

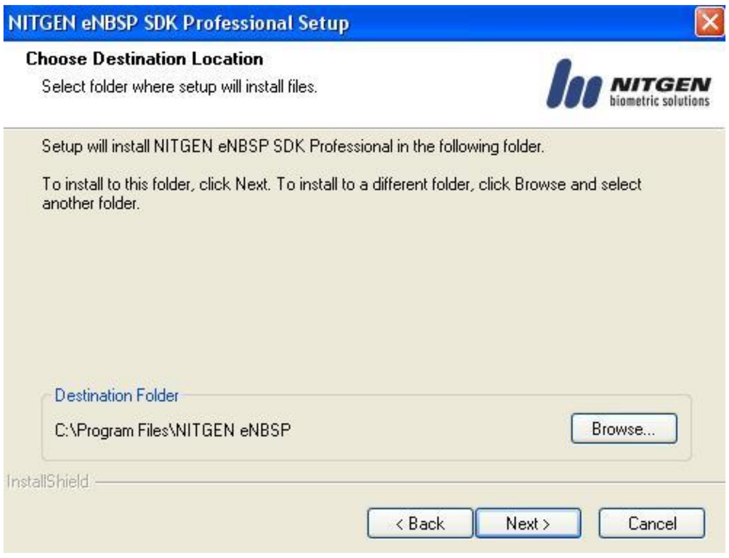
Please enter your name, the name of the company for which you work and the product serial number.

User Name: CHUL

Company Name: NITGEN

Serial Number:

7. Select a destination folder, then click **NEXT**. (The default destination is C:\Program Files\NITGEN eNBSP\)


NITGEN eNBSP SDK Professional Setup

Choose Destination Location

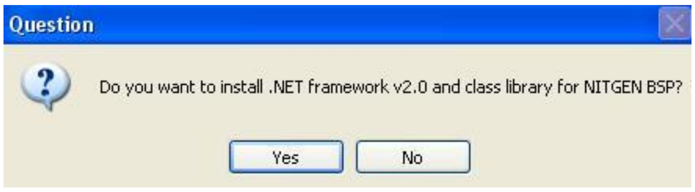
Select folder where setup will install files.

Setup will install NITGEN eNBSP SDK Professional in the following folder.

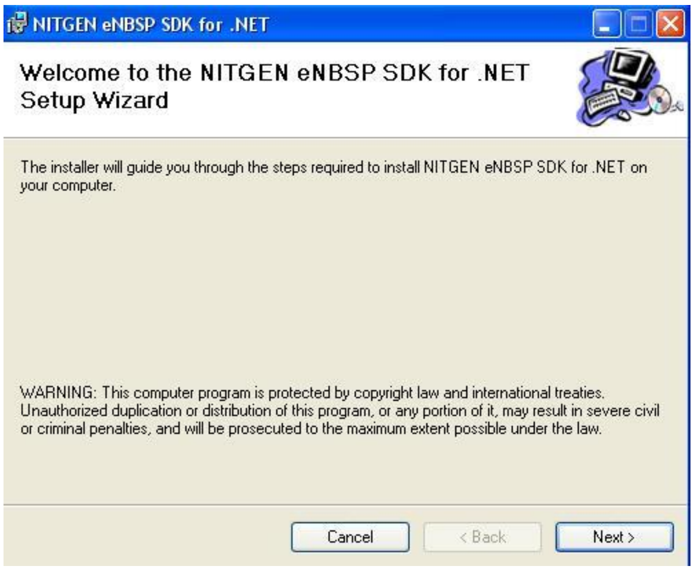
To install to this folder, click Next. To install to a different folder, click Browse and select another folder.

Destination Folder: C:\Program Files\NITGEN eNBSP

8. Setup prompts a dialog and asks to install Microsoft .NET Framework v2.0 and .NET Class Library for NBioBSP. Click YES to install. They may be installed later from \SDK\dotNET\Setup of the installation location.


Question

Do you want to install .NET framework v2.0 and class library for NITGEN BSP?



NITGEN eNBSP SDK for .NET

Welcome to the NITGEN eNBSP SDK for .NET Setup Wizard

The installer will guide you through the steps required to install NITGEN eNBSP SDK for .NET on your computer.

WARNING: This computer program is protected by copyright law and international treaties. Unauthorized duplication or distribution of this program, or any portion of it, may result in severe civil or criminal penalties, and will be prosecuted to the maximum extent possible under the law.

2.2.2 Linux SDK

1. Unpack the SDK file
2. Into unpacked directory and use install.sh script file for NBioBSP installation.
3. Use NBioBSP_Signer file for SN installation.
4. If you uninstall the SDK than uninstall.sh script file use.

Ex)

```
# tar -zxvf eNBSP-1.8.1-1.tar.gz
# cd eNBSP-1.8.1-1
# ./install.sh
# ./NBioBSP_Signer
```

2.3 Directories & Files

After the NBioBSP installation is complete, the following files are automatically copied to the designated directories.

2.3.1 Windows System Directory

NBioBSP.dll
Library main module

NBioBSPCOM.dll
NBioBSP COM module. This DLL is automatically registered on the system registry while running Setup.

NBioBSPCOMLib.dll
Required module for NBioBSP COM Module to use at .NET
Only available to be installed on 64bit and in case of 32bit, automatically created connecting NBioBSPCOM.dll project as reference

NImgConv.dll
Image conversion module. This module can be used to convert fingerprint raw images to bmp, jpeg and WSQ format. Refer to module manual provided separately. (only 32bit SDK)

2.3.2 Linux /usr/lib

libNBioBSP.so
Library main module.

2.3.3 Inc : Function header file

NBioAPI.h
Declarations for function prototypes and structures used in the SDK

NBioAPI_Basic.h
Declarations of Basic types used in NBioBSP

NBioAPI_Error.h
Declarations of error constants used in NBioBSP

NBioAPI_Type.h
Declarations of types used in NBioBSP

NBioAPI_Export.h
Declarations of some function prototypes for minutiae data conversion used in NBioBSP

NBioAPI_ExportType.h
Declarations of some data types and structures for minutiae data conversion used in NBioBSP

NBioAPI_IndexSearch.h
Declarations of function prototypes for 1:N matching engine.

NBioAPI_IndexSearchType.h
Declarations of some data types and structures for 1:N matching engine.

NBioAPI_ImgConv.h
Declarations of function prototypes for image conversion.

NBioAPI_CheckValidity.h

Function prototype used to check module validity

NBioAPI.bas

Declarations of basic types used in Visual Basic.

2.3.4 Lib : Library file (Windows SDK only)

NBioBSP.lib

NBioBSP library file (links NBioBSP module statically)

NBioBSP_CheckValidity.lib

Module for establishing the validity of NBioBSP module

2.3.5 Bin : Executable modules (Windows SDK)

SDK Module

NBioBSP.dll, NBioBSPCOM.dll

NBioBSPCOMLib.dll will be also installed together in 64bit OS.

Demo program

NBioBSP_Demo.exe : Sample program to test basic BSP functions.

NBioBSP_DataConvert.exe : Data Export / Import function demo application.

NBioBSP_UITest.exe : Sample program to test some part of user interface functions on the BSP module

NBioBSP_IndexSearchTest.exe : Sample program to test the IndexSearch functions.

NBioBSP_RollTest.exe : Sample program to test the Roll fingerprint functions.

NImgConverterDemo.exe : Sample program to test the Image converter functions.

NBioBSPCOM.cab

Cabinet file for distribution of NBioBSPCOM.dll on Web based environments.

2.3.6 Bin : Executable modules (Linux SDK)

SDK Module

libNBioBSP.so

Demo program

NBioBSP_Demo : Sample program to test basic BSP functions.

NBioBSP_DataConvert : Data Export / Import function demo application.

NBioBSP_IndexSearch : Sample program to test the IndexSearch functions.

NBioBSP_RollTest : Sample program to test the Roll fingerprint functions.

2.3.7 Skins : Skin files

NBSP2Eng.dll

English Language resource file. This file contains the English language version of the NBioBSP User Interface. The English resource is basically included in the NBioBSP module; it is not necessary to load this resource file to display the English UI.

NBSP2Kor.dll

Korean language resource file. This file contains the Korean language version of the NBioBSP User Interface.

NBSP2Jpn.dll

Japanese language resource file. This file contains the Japanese language version of the NBioBSP User Interface.

2.3.8 Samples : Sample programs

- **Visual Studio 2008 C++ (Windows SDK)**

  Sample program written in Visual Studio 2008 C++.

  32bit SDK

  NBioBSP_Demo – Basic function demo application.
  NBioBSP_DataConvert – Data Export / Import function demo application.
  NBioBSP_UITest - User Interface demo application.
  NBioBSP_IndexSearchTest – IndexSearch(1:N) demo application.
  NBioBSP_RollTest – Roll fingerprint function demo application.
  NImgConverter – Image converting demo application.

  64bit SDK

  NBioBSP_Demo – Basic function demo application.
  NBioBSP_DataConvert – Data Export / Import function demo application
  NBioBSP_UITest - User Interface demo application.
  NBioBSP_IndexSearchTest – IndexSearch(1:N) demo application.
  NBioBSP_RollTest – Roll fingerprint function demo application.

- **VisualBasic 6.0 (Windows SDK)**

  Sample program written in Visual Basic.

  32bit SDK

  BSPDemoVB – Basic function demo application.
  DataExportDemoVB – Data Export / Import function demo application.
  UITestVB - User Interface demo application.
  IndexSearchVB – IndexSearch(1:N) demo application.
  BSPRollDemoVB – Roll fingerprint function demo application.

  64bit SDK

  Not support.

- **Delphi 7 (Windows SDK)**

  Sample program written in Delphi.

  32bit SDK

  BSPDemoDP – Basic function demo application.
  UITestDP - User Interface demo application.
  IndexSearchDemoDP – IndexSearch(1:N) demo application.
  NImgConverterDB - Image converting demo application.

  64bit SDK

  Not support.

- **ASP (Windows SDK)**

  Sample program written in ASP.

- **C# (Windows SDK)**

  Sample program written in C#.

  32bit SDK

  BSPDemoCS – Basic function demo application.
  UITestCS - User Interface demo application.
  IndexSearchDemoCS – IndexSearch(1:N) demo application.
  BSPRollDemoCS – Roll fingerprint function demo application.

  64bit SDK

  Sample_dotNET_CSharp.sln – Sample program written in C# with .NET.
  Sample_COM_CSharp.sln – Sample program written in C# with COM.
  Sample_dotNET_VB.sln – Sample program written in VB.NET with .NET.

- **QtCreator (Linux SDK)**

  Sample program written in QtCreator.
  (32bit SDK use QtCreator v1.3.1, 64bit SDK use QtCreator v2.2.1)

  NBioBSP_Demo – Basic function demo application.
  NBioBSP_DataConvert – Data Export / Import function demo application.
  NBioBSP_IndexSearchTest – IndexSearch(1:N) demo application.
  NBioBSP_RollTest – Roll fingerprint function demo application.

2.3.9 dotNET : .NET module

NITGEN.SDK.NBioBSP.dll

The Class Library module for Microsoft .NET.

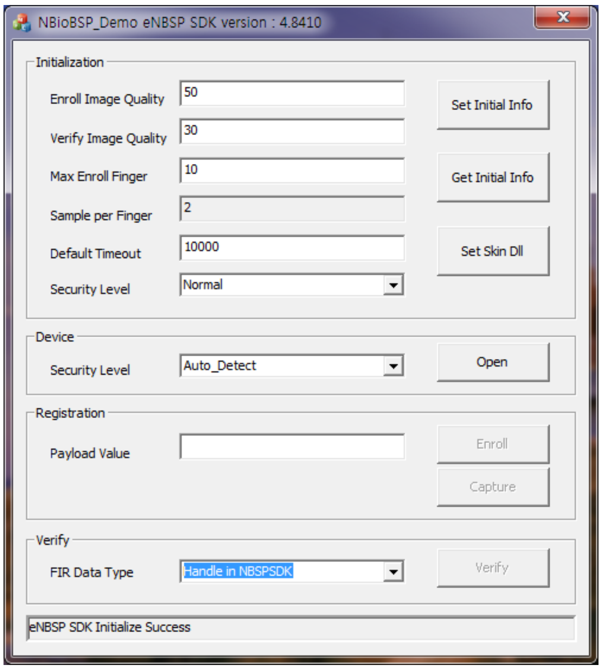
2.3.10 dotNET\Setup : .NET setup files

NBioBSP.NET_Setup.msi

Installation module for Microsoft .NET Framework v2.0 and NBioBSP .NET Class Library. This module can be used if they were not included on the first installation.

2.4 Demo Program

2.4.1 BSP Demo



NBioBSP_Demo eNBSP SDK version : 4.8410

Initialization

Enroll Image Quality	50	Set Initial Info
Verify Image Quality	30	
Max Enroll Finger	10	Get Initial Info
Sample per Finger	2	
Default Timeout	10000	Set Skin Dll
Security Level	Normal	

Device

Security Level	Auto_Detect	Open

Registration

Payload Value		Enroll
		Capture

Verify

FIR Data Type	Handle in NBSPSDK	Verify

eNBSP SDK Initialize Success

The NBioBSP Demo Program includes four sections

- **Initalization**

You can set or get NBioBSP default values in this section.
When you execute BSPdemo.exe, it displays BSP default values first. Click the “Get” button to retrieve the default values, or enter values in each field you wish to change - click “Set” to apply the new settings.

Enroll image quality :
Quality level of the fingerprint image for enrollment; value range is 30 to 100. The default value is 50.

Verify image quality :
Quality level of the fingerprint image for verification; value range is 0 to 100. The default value is 0.

Max Finger :
Maximum number of fingers that can be enrolled into one template.

SamplesPerFinger :
Number of fingerprint samples for enrollment; default value is 2.   (At present it is read only.)

Default Timeout :
Timeout value for enrollment (in milliseconds). Default timeout value is 10000ms(10sec) and this value is recommended. (0 = Infinite)

Security Level :
Security level settings range from 1 to 9. Default value is 5 (mid-level of security). The higher the security level is, the lower the FAR (False Acceptance Rate) becomes and the higher the FRR (False Rejection Rate) becomes.

- **Device**

The “Device functions” section shows the list of fingerprint devices currently connected to the system.
Any fingerprint devices connected can be selected for use in NBioBSP. After selecting the device, click “Open” to activate the device in NBioBSP.
Auto_Detect will automatically search for the device that was used in the last NBioBSP session.

- **Registration**

The “Enroll” section tests the user enrollment function. If you enter a User ID, it is inserted into FIR data area as a payload.

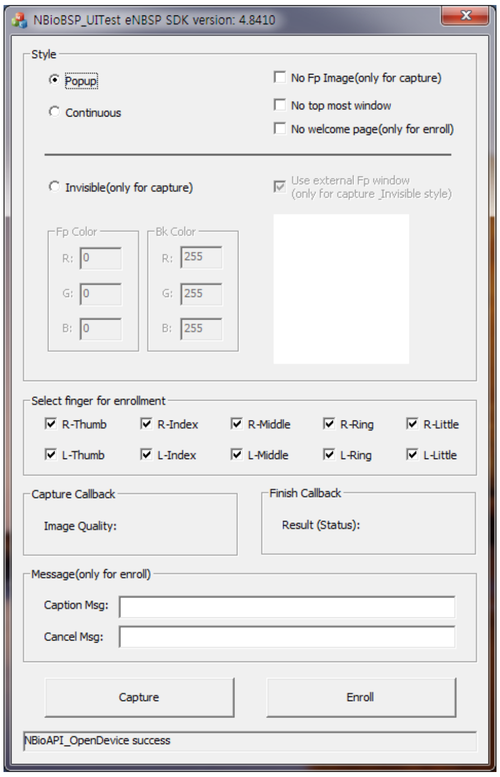
- **Verify**

The “Verify” section tests the verification function. The BSP can perform verification in three ways: by using the FIR handle, the FIR, or text-encoded FIR.
If the enrolled fingerprint data contains a payload (User ID in this example), the UserID is returned after successful verification.
For each type, the BSP Demo Program also shows how FIR can be converted into a stream data for file saving or network transmission.

2.4.2 UI Test

The UI Test sample program demonstrates practical example codes that can be used to provide customized user interface for various users of the NBioBSP module. These features can be configured, by using the NBioAPI_WINDOW_OPTION structure.

Execute the NBioBSP UI Test Program to display the following window.


NBioBSP_UITest eNBSP SDK version: 4.8410

Style
- (●) Popup
- ( ) Continuous
- ( ) Invisible(only for capture)
- [ ] No Fp Image(only for capture)
- [ ] No top most window
- [ ] No welcome page(only for enroll)
- [✓] Use external Fp window (only for capture ,Invisible style)

Fp Color		Bk Color	
R:	0	R:	255
G:	0	G:	255
B:	0	B:	255

Select finger for enrollment
- [✓] R-Thumb [✓] R-Index [✓] R-Middle [✓] R-Ring [✓] R-Little
- [✓] L-Thumb [✓] L-Index [✓] L-Middle [✓] L-Ring [✓] L-Little

Capture Callback: Image Quality:

Finish Callback: Result (Status):

Message(only for enroll)
- Caption Msg:
- Cancel Msg:

NBioAPI_OpenDevice success

■ **Window Style Setting**

After changing the Window style, have a test with clicking ‘Capture” or ‘Enroll’ button. Some styles work with the ‘Capture’ button and others with the ‘Enroll’ button.

Popup :

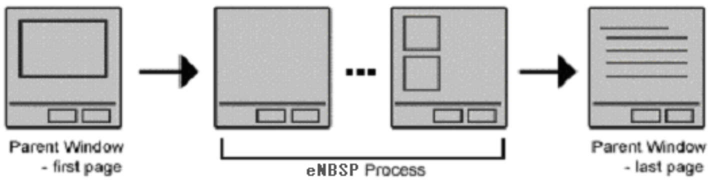
First, set the NBioAPI_WINDOW_STYLE_POPOP value in the Style. The default is the popup style on the parent Window.

Continuous :

Set the NBioAPI_WINDOW_STYLE_CONTINUOUS value in the Style. This option can be used for fingerprint enrollment (Enroll) only. The handle of parent window must also be set in the ParentWnd parameter.

This option can be used to make a customized enrollment wizard including some additional pages before/after the NBioBSP enrollment process in a tricky way. In other words, starting the enrollment function hides the parent window until this function is finished, and this visual effect shows these continuous enrollment pages to be looking like in a same wizard when all pages are in same size and position.

The Continuous enrollment process is as follows.



When using this option, the first page of the NBioBSP enrollment process contains ‘Back’ button, clicking this button returns the NBioAPIERROR_USER_BACK, and the last page displays ‘Next” button instead of ‘Finish’ button.

Invisible :

Set the NBioAPI_WINDOW_STYLE_INVISIBLE value in the Style. This option can be used for fingerprint capture (Capture) only. When calling the Capture function with this option, the fingerprint device blinks and captures fingerprints, but no dialog prompts. This option can be used to display fingerprint images on the other window than the NBioBSP dialog.

No Fp Image :

This flag can be set when fingerprint images must not be displayed on the NBioBSP dialog when calling the Capture function.

No top most window :

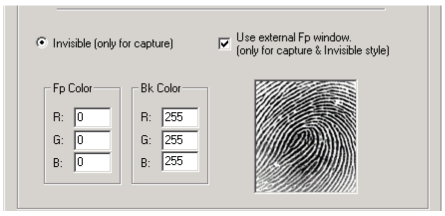
This flag can be set when the NBioBSP enrollment or capture dialog is not needed to be the top most window.

No welcome page :

This flag is to hide the welcome page on the enrollment wizard on both Popup and Continuous styles.

Use external Fp window :

This example describes how to implement the fingerprint capturing process when using the Invisible style. The window handle must be set in the FingerWnd parameter.

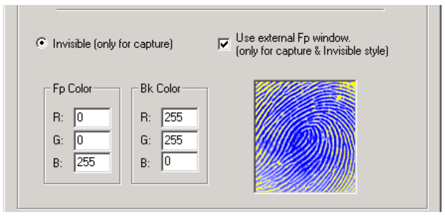


● Invisible (only for capture)   ✓ Use external Fp window. (only for capture & Invisible style)

Fp Color		Bk Color	
R:	0	R:	255
G:	0	G:	255
B:	0	B:	255

Fp Color / Bk Color :

Color settings for fingerprint images and background.

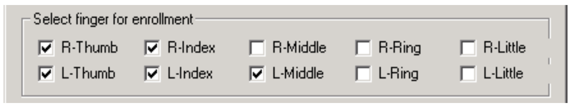


● Invisible (only for capture)   ✓ Use external Fp window. (only for capture & Invisible style)

Fp Color		Bk Color	
R:	0	R:	255
G:	0	G:	255
B:	255	B:	0

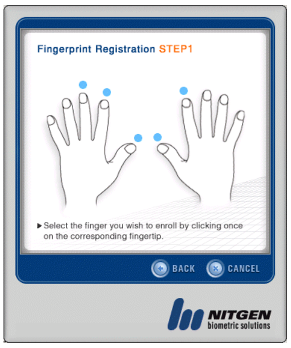
■ **Select finger for enrollment**

This example shows how to enable and disable fingers when using the Enroll function.



Select finger for enrollment

✓ R-Thumb	✓ R-Index	☐ R-Middle	☐ R-Ring	☐ R-Little
✓ L-Thumb	✓ L-Index	✓ L-Middle	☐ L-Ring	☐ L-Little



Fingerprint Registration STEP1

▸Select the finger you wish to enroll by clicking once on the corresponding fingertip.

■ Capture Callback & Finish Callback

Capture Callback :

This callback function is called when capturing fingerprints by the Capture function, and receives the fingerprint data and quality. This example shows the fingerprint quality being changed while capturing fingerprints from the device.

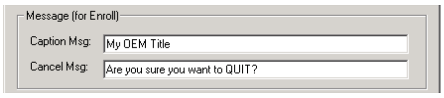
Finish Callback :

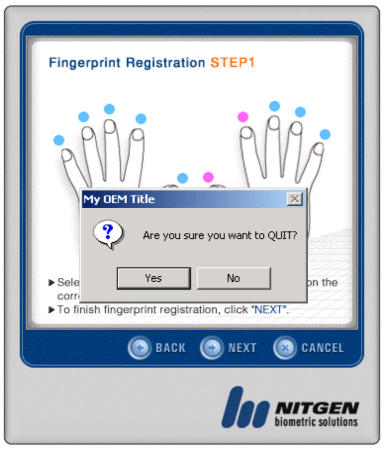
This callback function is called when the enrollment or capturing dialog is closed by the Capture or Enroll function. This callback can be used to prepare an error handling routine before the window is closed.

■ Message

Caption and Cancel Msg:

This function is only for fingerprint enrollment. When the enrollment is canceled by 'CANCLE' button, a message box displays a confirming message with the text entered on the Caption and Cancel Msg,


Message (for Enroll)
Caption Msg: My OEM Title
Cancel Msg: Are you sure you want to QUIT?


Fingerprint Registration STEP1

My OEM Title
Are you sure you want to QUIT?
Yes No

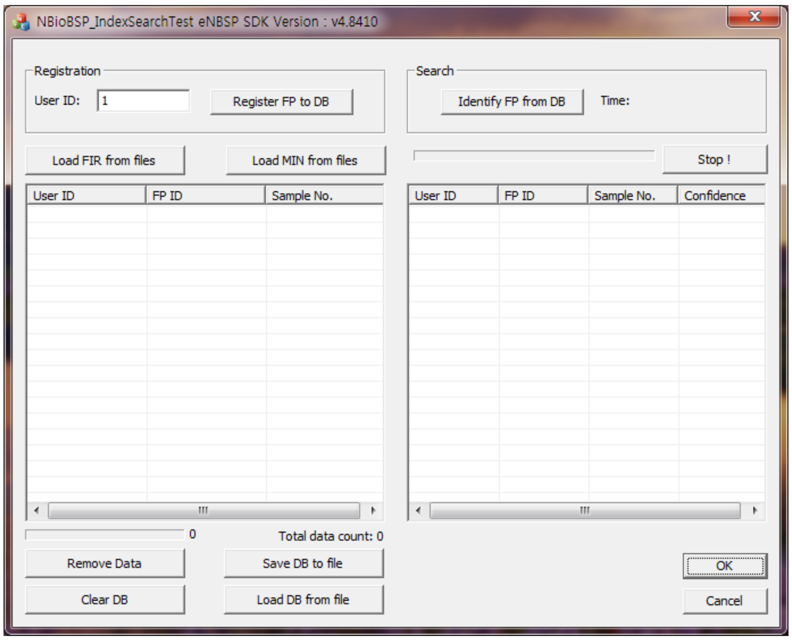
▸Sele... on the corr...
▸To finish fingerprint registration, click "NEXT".

2.4.3 Usage of IndexSearchTest Test

The NBioBSP provides a new 1:N matching technique, called the IndexSearch, that has been designed and optimized for small-to-medium sized fingerprint database, a volume of 5,000 fingerprints or smaller. The IndexSearch can produce much faster searching performance result than a sequential 1:1 matching technique up to 5,000 times. The following sample program shows how to use the IndexSearch APIs.

NBioBSP also includes the NSearch APIs that are more advanced matching techniques for use of large sized fingerprint database. It is recommended that the NSearch be used for 1:N matching from a large database such as more than 5,000 fingerprints.

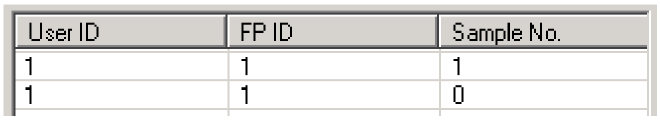
Starting the sample program will display the following screen.



This demo program consists of list boxes displaying fingerprint data and search results, and some operational function buttons to control the fingerprint DB for the IndexSearch Engine to be initialized, stored and deleted.

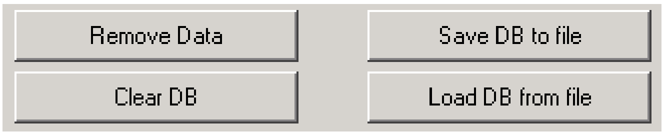
■ **Register FP to DB : Fingerprint Registration**

Enter a user ID that must be numeral, and click the button, “Register FP to DB”, and complete fingerprint registration from the NBioBSP fingerprint enrollment sequence. A successful registration displays an item of fingerprint information on the following list.



User ID	FP ID	Sample No.
1	1	1
1	1	0

The NBioBSP fingerprint enrollment process requires two fingerprint to be captured, which will cause two items to be listed with the same user ID. For example, the picture above represents there are two thumb fingerprints (FP ID = 1) of user ID, “1”.



■ **Remove Data : Fingerprint Deletion**

Select a list item and click the button, “Remove Data”, then the corresponding fingerprint data will be deleted.

■ **Clear DB : Fingerprint DB initialization**

Click the button, “Clear DB” to initialize the fingerprint DB, which means that all fingerprint data will be deleted. The fingerprint DB needs to be recreated.

■ **Save DB to file : Saving Fingerprint DB into a File**

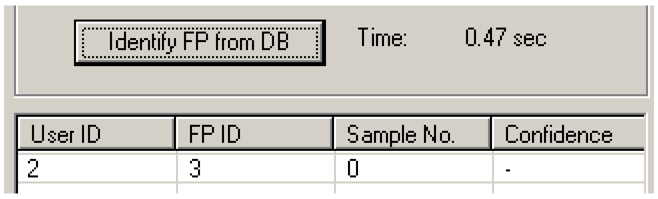
The IndexSearch engine works with the fingerprint DB in memory of an application, and the application termination will cause all fingerprint DB to be lost. The fingerprint DB may be stored into a file before the application ends, and it can be loaded into memory on the next start of the application to be used for a fingerprint DB.

Click the “Save DB to file” button and enter the file name and location to be stored. It creates two files, *.ISDB and *.FID. The *.ISDB file contains the fingerprint DB in binary format, and the *.FID stores the list of fingerprint data. Note that the *.FID file must be created by an application developers.

■ **Load DB from file : Loading Fingerprint DB from a File**

The fingerprint DB files may be read when application starts and loaded into memory.
Click the “Load DB from file” button and select the file to complete loading the fingerprint DB into memory.

■ **Identify FP from DB : Searching Fingerprint DB**



0.47 sec

User ID	FP ID	Sample No.	Confidence
2	3	0	-

Click the “Identify FP from DB” button to perform 1:N identification with the fingerprint DB and to display the first result returned.

■ **Load FIR from file : Loading Fingerprint DB from FIR File**

The FIR files may be read when application starts and loaded into memory.

■ **Load MIN from file : Loading Fingerprint DB from Min File**

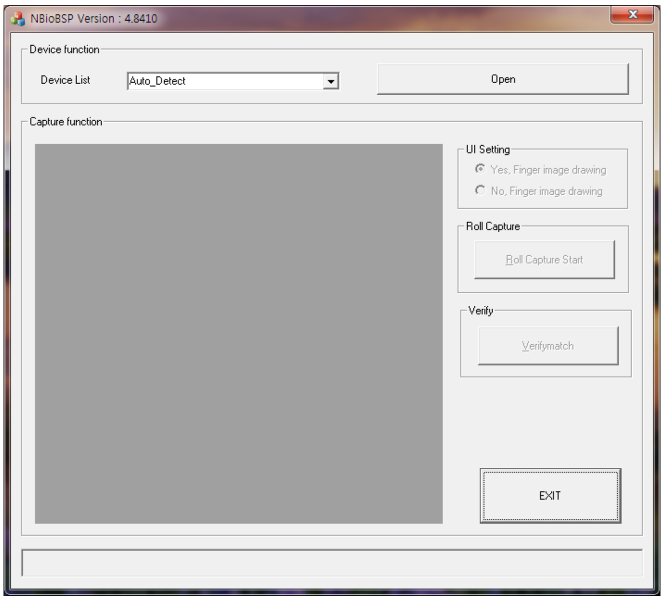
The Min files may be read when application starts and loaded into memory.

Note that the IndexSearch engine has almost same API structures as the NSearch engine. The NSearch manual may be referred for more information about the IndexSearch engine.

2.4.4 RollDemo Test

Run the RollDemo program to test the roll functions of NBioBSp and verify a successful installation.

Execute the NBioBSP UI Test Program to display the following window



■ **Device function**

The “Device functions” section shows the list of fingerprint devices currently connected to the system. Any fingerprint devices connected can be selected for use in NBioBSP.

■ **Roll Capture**

Click “Roll Catpure Start” to capture roll fingerprint.

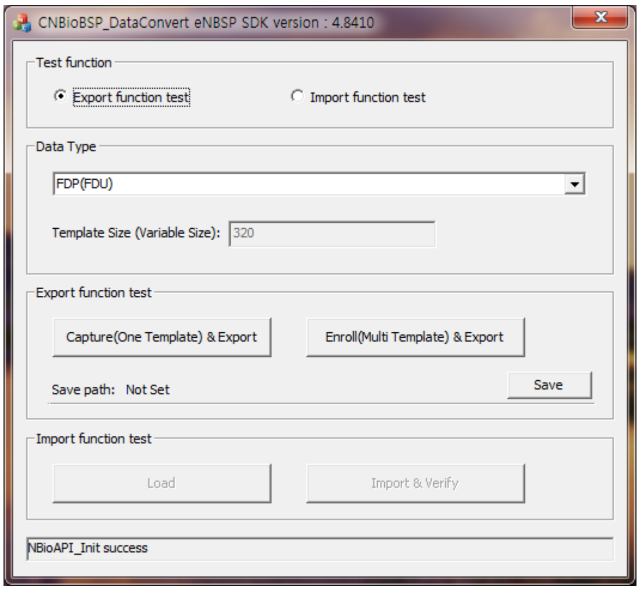
■ **Verify**

Click “Verifymatch” to test verification.

2.4.5 Data Convert

FIR data convert function demo application.

Execute the NBioBSP_DataConvert Program to display the following window



(●) Export function test ( ) Import function test

Data Type: FDP(FDU)

Template Size (Variable Size): 320

Save path: Not Set

NBioAPI_Init success

■ **Test function**

Export Function test
This flag will enable the export function.

Import function test
This flag will enable the import function.

■ **Data Type**

The “Data Type” section shows the list of data type.
MINCONV_TYPE_TEMPLATESIZE_32 ~ MINCONV_TYPE_TEMPLATESIZE_112, Currently does not support.

■ **Export function test**

Click “Capture(One Template) & Export” or “Enroll(Multi Template) & Export” to capture finger image and template.
Click “Save” to save template data.

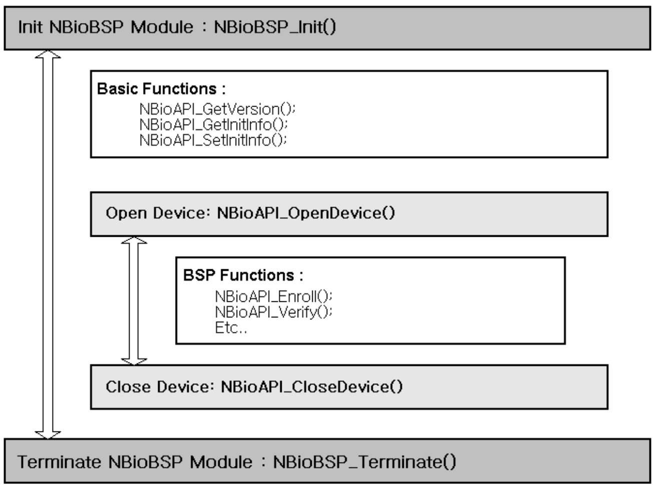
■ **Import function test**

Click “Load” to load template data.
Click “Import & Verify” to import template data and verification.

Chapter 3. C / C++ Programming

This chapter explains programming in C/C++. Sample source code was written using NBioBSP.dll.

The below diagram show NBioBSP function usage structure.



Init NBioBSP Module : NBioBSP_Init()
Basic Functions :
NBioAPI_GetVersion();
NBioAPI_GetInitInfo();
NBioAPI_SetInitInfo();
Open Device: NBioAPI_OpenDevice()
BSP Functions :
NBioAPI_Enroll();
NBioAPI_Verify();
Etc..
Close Device: NBioAPI_CloseDevice()
Terminate NBioBSP Module : NBioBSP_Terminate()

[Function Structure]

3.1 Check Module Validity

NBioBSP.dll is digitally signed to prevent tampering and to ensure the integrity of its contents. The NBioBSP SDK provides a method of checking the NBioBSP.dll module for signs of tampering; although the validity check is optional, NITGEN recommends using this feature as a precaution.

The ***NBioAPI_CheckValidity()*** function is called to check module validation; this function uses “NBiobsp.dll” as a parameter. The function prototype is defined in “NBioAPI_CheckValidity.h,” and the library file is “NBioAPI_CheckValidity.lib.”

NITGEN recommends using the function NBioAPI_CheckValidity() to ensure NBioBSP integrity

```
#include "NBioAPI_CheckValidity.h"
...
bool IsValidModule()
{
  if (NBioAPI_CheckValidity(_T("NBioBSP.dll")) == NBioAPIERROR_NONE)
    return true;
  else
    return false;
}
```

3.2 Module Initialization & Termination

The NBioBSP module must be initialized before use. This is done using the NBioAPI_Init() function. NBioAPI_Init() returns the handle of the NBioBSP module; this handle will be used for the duration of the session (for as long as the application needs to use the NBioBSP module).

The NBioAPI_Terminate() function must be called to terminate use of the NBioBSP Module. The NBioAPI_Terminate() function frees the memory allocated to the NBioBSP module and releases the handle.

3.2.1 Initialize Module

NBioAPI_Init() is the function that initializes the NBioBSP module. NBioAPI_Init() returns the Handle of the NBioBSP module used in the application.

```
NBioAPI_HANDLE  g_hBSP;            // NBioBSP module Handle.
...
// Initialize BSP Module
if ( NBioAPI_Init(&g_hBSP) != NBioAPIERROR_NONE )
{
// Init module failed.
}
// Init success.
```

3.2.2 Terminate Module

NBioAPI_Terminate() frees the memory used by the NBioBSP module. This function must be called prior to terminating the application.

```
NBioAPI_HANDLE  g_hBSP;       // Declaration NBioBSP module Handle
NBioAPI_RETURN  ret;
...
ret = NBioAPI_Terminate(g_hBSP);  // Terminate BSP Module
```

3.3. Device Functions

The functions that control the fingerprint device can only be used after the device is first opened. Before opening the device, however, the NBioAPI_EnumerateDevice() can be used to get information about the fingerprint recognition devices connected to the system. After calling NBioAPI_EnumerateDevice() to retrieve device information, open the device by calling NBioAPI_OpenDevice().

Device-related functions:

NBioAPI_EnumerateDevice()

NBioAPI_EnumerateDeviceEx()*

NBioAPI_OpenDevice()

NBioAPI_CloseDevice()

NBioAPI_GetDeviceInfo()

NBioAPI_AdjustDevice()

*Note : (*) Marked function is supported after eNBSP SDK v4.72.

3.3.1 Enumerating Devices

The NBioAPI_EnumerateDeviceEx() function is to retrieve specific device information; the number of devices installed, and the device IDs. The Device ID consists of the device name and an instance number. The lower byte of the Device ID represents the device name; the higher byte represents the device instance number.
If, for example, there are two FDU01 (USB port) devices installed on the system, the device ID of one FDU01 becomes 0x0002, and the device ID of the other FDU01 becomes 0x0102. The maximum number of devices supported is 254, is defined in NBioAPI_MAX_DEVICE.

```
NBioAPI_RETURN     ret;
NBioAPI_UINT32     nDeviceNum;
NBioAPI_DEVICE_ID  *pDeviceList;
NBioAPI_DEVICE_INFO_EX *pDeviceInfoEx;

// Get device list
ret = NBioAPI_EnumerateDeviceEx(g_hBSP, &nDeviceNum,
                                   &pDeviceList, &pDeviceInfoEx);
CString device_name;
CString device_id;

for ( I = 0; I < nDeviceNum; I++)
{
   device_id = pDeviceList[i];
   device_name = pDeviceInfoEx[i].Name;
}
```

NBioAPI_EnumerateDeviceEx() returns the number of devices installed in the second parameter, nDeviceNum, the device IDs in the third parameter, pDeviceList, and the detail information of device in the forth parameter, pDeviceInfoEx.

The NBioBSP module internally allocates the memory used by pDeviceList and pDeviceInfoEx, so it is unnecessary for the application to allocate memory for pDeviceList and pDeviceInfoEx.

Device Name	Value
NBioAPI_DEVICE_NAME_FDP02	0x01
NBioAPI_DEVICE_NAME_FDU01 / 04 / 06	0x02
NBioAPI_DEVICE_NAME_OSU02	0x03
NBioAPI_DEVICE_NAME_FDU11 / 14	0x04
NBioAPI_DEVICE_NAME_FSC01	0x05
NBioAPI_DEVICE_NAME_FDU03 / 13	0x06
NBioAPI_DEVICE_NAME_FDU05 / 07	0x07
NBioAPI_DEVICE_NAME_FDU08	0x08
NBioAPI_DEVICE_NAME_FDU09	0x09
(Other device)	(Refer to pDeviceInfoEx)

[Predefined device name in NBioAPI]

3.3.2 Device Initialization

NBioAPI_OpenDevice() is used to initialize a device. The NBioAPI_EnumerateEx() function returns the list of device IDs that can be initialized using NBioAPI_OpenDevice().
The NBioAPI_OpenDevice() will automatically open the device installed on the system if NBioAPI_DEVICE_ID_AUTO is specified as the device ID.

```
// Open device, device auto detect
m_DeviceID = NBioAPI_DEVICE_ID_AUTO;
ret = NBioAPI_OpenDevice(g_hBSP,  m_DeviceID)       // Open device
if ( ret != NBioAPIERROR_NONE )
    // Open device failed
else
    // Open device success.
```

3.3.3 Closing Device

Calling the function NBioAPI_CloseDevice() will close the device currently being used by the NBioBSP Module.

```
// Close device
ret = NBioAPI_CloseDevice(g_hBSP, m_DeviceID);
if ( ret != NBioAPIERROR_NONE )
    // Close device failed
else
    // Close device success.
```

3.3.4 Getting Device Information

NBioAPI_GetDeviceInfo() is used to get detailed device information. The function takes the device ID for the second parameter, 0 for the third parameter, and the pointer NBioAPI_DEVICE_INFO for the fourth parameter.

```
// Get Device Info
NBioAPI_DEVICE_INFO device_info;
ret = NBioAPI_GetDeviceInfo(g_hBSP, m_DeviceID, 0, &device_info);
if ( ret != NBioAPIERROR_NONE )
{
   // GetDeviceInfo() failed.
}
```

3.4. Fingerprint Enrollment

Fingerprint data processed in the NBioBSP are in Fingerprint Identification Record (FIR) format. Templates are FIR data used for enrollment.

The NBioAPI_Enroll() function is used to enroll (register) fingerprint data.

```
ret = NBioAPI_Enroll(
          g_hBSP,                  // NBioBSP Handle
          NULL,                    // Stored template
          &g_hEnrolledFIR,         // Handle of FIR to be enrolled
          NULL,                    // Input payload
          -1,                      // Capture timeout
          NULL,
          NULL                     // Windows options
);
...
NBioAPI_FreeFIRHandle(g_hBSP, g_hEnrolledFIR);// Free FIR Handle
```

The FIR returned by calling the NBioAPI_Enroll() function resides in the NBioBSP module – the application cannot know the FIR structure, and refers to it only as a Handle.

3.4.1 Retrieving the FIR

The FIR handle returned by NBioAPI_Enroll() function cannot be used directly in a file or a database unless it is first retrieved from NBioBSP.

NBioAPI_GetFIRFromHandle() is used to retrieve the FIR associated with a FIR handle. The next example shows how to retrieve the FIR from a FIR handle.

```
NBioAPI_FIR g_FIR;
ret = NBioAPI_GetFIRFromHandle(g_hBSP, g_hEnrolledFIR, &g_FIR);
```

The FIR consists of Format, Header, and Data parts. The Data part contains the address of the contiguous fingerprint data area. The fingerprint data is of variable length, thus the DataLength field in the header contains the size of the fingerprint data. The total size of the FIR is the sum of the format size, the header, and the fingerprint data.

FIR length = Format length + Header length + Fingerprint data length

In order to use FIR in a file, database, or network transmission, it must be converted into a stream form. (This will be explained further in the following section.)

Member		Description
Format		FIR format
Header	Length	FIR header length
	DataLength	Fingerprint data length
	Version	FIR version
	DataType	Type of FIR
	Purpose	Purpose of FIR
	Quality	Currently not used
	Reserved	Reserved area
Data		The address of contiguous fingerprint data

[NBioAPI_FIR Structure]

3.4.2 Converting the FIR into a binary stream

The FIR must be converted into a stream format in order to be used in a file or a database. An example below shows the process for converting the FIR into a stream. When the FIR is no longer needed, free the memory space allocated for the FIR by using NBioAPI_FreeFIR() function. NBioAPI_FreeFIR() function frees the memory allocated for the fingerprint data inside the NBioBSP module.

```
NBioAPI_FIR               g_FIR;
DWORD             length;


// Get FIR from FIR Handle
ret = NBioAPI_GetFIRFromHandle(g_hBSP, g_hEnrolledFIR, &g_FIR);
if ( ret == NBioAPIERROR_NONE )
{
   // Make stream data from FIR
   BYTE* binary_stream;
   length=sizeof(g_FIR.Format)+g_FIR.Header.Length+
        g_FIR.Header.DataLength;
        binary_stream = new BYTE[length];
        memcpy(&binary_stream[0], &g_FIR.Format, sizeof(g_FIR.Format));
       memcpy(&binary_stream[sizeof(g_FIR.Format)],&g_FIR.Header, g_FIR.Header.Length);
       memcpy(&binary_stream[sizeof(g_FIR.Format)+g_FIR.Header.Length], &g_FIR.Data,
                  g_FIR.Header.DataLength);

        // Save binary data to file or database
        delete [] binary_stream;
    }
    ...
    NBioAPI_FreeFIR(g_hBSP, &g_FIR);   // Free FIR
```

3.4.3 Retrieving the Text-encoded FIR

In some programming environments such as Visual Basic or Delphi, or in a web environment, the text-encoded FIR may be needed.

The NBioAPI_GetTextFIRFromHandle() function retrieves the text-encoded FIR from NBioBSP.
Unlike the NBioAPI_GetFIRFromHandle() function, the FIR that is returned is text data with a different format than the standard C structure of a normal FIR.
When calling the NBioAPI_GetTextFIRFromHandle() function, it is necessary to specify whether to get the text data in a multi-byte format or not.
The NBioAPI_GetTextFIRFromHandle() function takes NBioAPI_TRUE as the fourth parameter to get the multi-byte text data, otherwise, NBioAPI_FALSE.

```
    NBioAPI_FIR_TEXTENCODE        g_firText;  // Text encoded FIR

    // Get Text encoded FIR from FIR handle
    ret = NBioAPI_GetTextFIRFromHandle(g_hBSP, g_hEnrolledFIR, &g_firText, NBioAPI_FALSE);

    if ( ret == NBioAPIERROR_NONE )
    {
        char* text_stream;
        DWORD length;
        length = lstrlen(g_firText.TextFIR);
        if (g_firText.IsWideChar == NBioAPI_TRUE))
           text_stream = new char [(length + 1)*2];
        else
           text_stream = new char [length + 1];
        memcpy(text_stream, &g_firText.Data, length + 1);

        // Save text_stream to File or Database
        ...
        delete [] text_stream
    }

    NBioAPI_FreeTextFIR(g_hBSP, &g_firText);  // Free TextFIR handle
```

The parameter g_firText returned by calling NBioAPI_GetTextFIRFromHandle() contains the information needed to determine whether the text data is in multi-byte format or not, and the address of the text-encoded FIR.

Member	Description
IsWideChar	Specifies whether it is multi-byte format or not (NBioAPI_TRUE : Wide char)
TextFIR	The address of the text-encoded FIR

[NBioAPI_FIR_TEXTENCODE Structure]

3.5 Verification

The NBioAPI_Verify () function captures the fingerprint data from a device and compares that sample against the previously enrolled FIR. This function returns the verification result in the third parameter as “True” or “False” after comparison.

As explained in section 3.4, the FIR may be in any of three forms: the FIR Handle, the FIR, or the text-encoded FIR. Each form of the FIR can be specified in the Form member of the NBioAPI_INPUT_FIR structure.

Member		Description
Form	NBioAPI_FIR_FORM_HANDLE	Handle type FIR
	NBioAPI_FIR_FORM_FULLFIR	FIR
	NBioAPI_FIR_FORM_TEXTENCODE	Text type FIR
InputFIR	FIRinBSP	Pointer of FIR Handle
	FIR	Pointer of FIR
	TextFIR	Pointer of Text FIR

[NBioAPI_INPUT_FIR Structure]

3.5.1 Verification with the FIR Handle

In order to verify with the FIR Handle, input NBioAPI_FIR_FORM_HANDLE in the Form of NBioAPI_INPUT_FIR, and input the FIR Handle in the InputFIR.FIRinBSP member, then call the NBioAPI_Verify () function.

```
NBioAPI_BOOL result;               // Variable for verification result
NBioAPI_INPUT_FIR inputFIR;        // Set input FIR.
inputFIR.Form = NBioAPI_FIR_FORM_HANDLE;      // Set FIR type
inputFIR.InputFIR.FIRinBSP = &g_hEnrolledFIR; // Set FIR handle pointer

if ( g_hBSP != NBioAPI_INVALID_HANDLE )     // Check NBioBSP handle
{
   ret = NBioAPI_Verify(   // Verify
      g_hBSP,              // Handle of NBioBSPmodule
      &inputFIR,           // Stored FIR
      &result,             // Result of verification
      NULL,                // Payload in FIR
      10000,               // Timeout for scan image
      NULL,                // Audit data
      NULL        );               // Window option

   if ( result  == NBioAPI_TRUE)
     // Verification success
   else
      // Verification failed
 }
```

3.5.2 Verification with the FIR

In order to verify with the FIR, input NBioAPI_FIR_FORM_FULLFIR in the Form of NBioAPI_INPUT_FIR, the address of the FIR in the InputFIR.FIR member, then call the NBioAPI_Verify () function.

```
NBioAPI_INPUT_FIR inputFIR;        // Set input FIR.
NBioAPI_BOOL result;               // Variable for result of verification

NBioAPI_INPUT_FIR inputFIR;
inputFIR.Form = NBioAPI_FIR_FORM_FULLFIR;// Set input FIR to Full FIR
inputFIR.InputFIR.FIR = &g_FIR;

// Matching
if ( g_hBSP != NBioAPI_INVALID_HANDLE )     // Check NBioBSP handle
  ret = NBioAPI_Verify(
    g_hBSP,                                 // Handle of NBioBSP module
    &inputFIR,                     // Stored FIR
    &result,                       // Result of verification
    NULL,                          // Payload in FIR
    10000,                         // Timeout for scan image
    NULL,                          // Audit data
    NULL                           // Window option
);

if ( result  == NBioAPI_TRUE)
  // Verification success
else
  // Verification failed
```

If the fingerprint data is in a file or database, the stream must first be converted into the FIR. The code below shows the conversion process.

```
// convert binary stream data to FIR
NBioAPI_FIR g_FIR;
char* binary_stream;
// fill binary stream from file or DB
// get length of binary stream

// total_length = length of binary stream;
format_length = sizeof(g_FIR.Format);
header_length = sizeof(g_FIR.Header);
data_length = total_length – (format_length + header_length);
g_FIR.Data = new NBioAPI_UINT8 [data_length];

memcpy(&g_FIR.Format, &binary_stream[0], format_length + header_length);
memcpy(g_FIR.Data, &binary_stream[format_length+header_length], data_length);
```

3.5.3 Verification with Text-Encoded FIR

If the FIR is in text-encoded format, use NBioAPI_FIR_FORM_TEXTENCODE for the form of NBioAPI_INPUT_FIR, and the address of text-encoded FIR in the InputFIR.

TextFIR member when calling the NBioAPI_Verify() API. The following example shows the verification process with the text-encoded FIR.

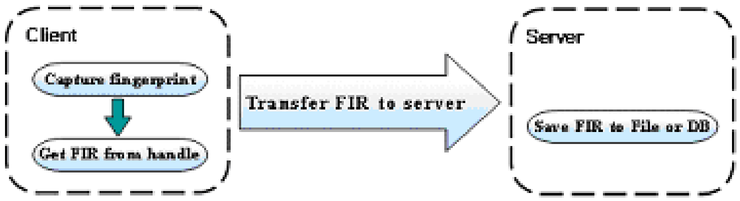
```
NBioAPI_INPUT_FIR inputFIR;                         // Set input FIR.
inputFIR.Form = NBioAPI_FIR_FORM_TEXTENCODE;        // Set input FIR to
                                            // text encoded FIR
inputFIR.InputFIR.TextFIR = &g_TextFIR;

if ( g_hBSP != NBioAPI_INVALID_HANDLE)      // Check NBioBSP handle
   ret = NBioAPI_Verify(
         g_hBSP,          // Handle of NBioBSP module
         &inputFIR,       // Stored FIR
         &result,         // Result of verification
         NULL,            // Payload in FIR
         10000,           // Timeout for scan image
         NULL,              // audit data
         NULL);           // Window option
```

If the fingerprint data is in a file or database, the stream needs to be converted into the text-encoded FIR (NBioAPI_FIR_TEXTENCODE).

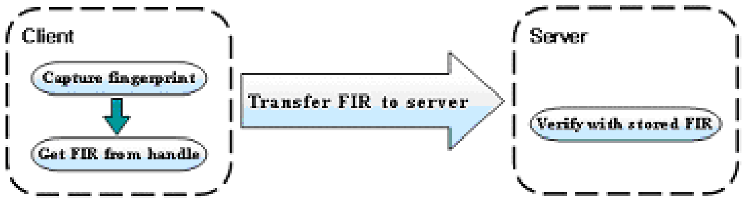
```
NBioAPI_FIR_TEXTENCODE g_TextFIR; // Set input FIR.
char* text_stream;

// fill text_stream buffer from file or database
length = lstrlen(text_stream);
// Fill g_TextFIR structure
g_TextFIR.IsWideChar = NBioAPI_FALSE;   // It depends on application
g_TextFIR.TextFIR = new NBioAPI_CHAR [length + 1];
memcpy(g_FIR.TextFIR, text_stream, length + 1);
```

3.6 The Client/Server Environment

In a client/server environment, fingerprint capture is executed on the client system and the matching and storing of the fingerprint data takes place on server system. For this reason, high level functions such as NBioAPI_Enroll() and NBioAPI_Verify() cannot be used. Instead, low level APIs such as NBioAPI_Capture(), NBioAPI_CreateTemplate (), and NBioAPI_VerifyMatch() will be used.



[Fingerprint Enrollment Process on a C/S environment]



[Fingerprint Verification Process in a Client/Server Environment]

3.6.1 Capturing Fingerprint Data

To capture fingerprint data on a client system, use the NBioAPI_Capture() function with the purpose of capturing in the second parameter.

The value that is specified for NBioAPI_FIR_PURPOSE will determine which wizard is displayed.

Value	**Description**
NBioAPI_FIR_PURPOSE_VERIFY	for Verification
NBioAPI_FIR_PURPOSE_IDENTIFY	for Identify (currently not used)
NBioAPI_FIR_PURPOSE_ENROLL	for Registration
NBioAPI_FIR_PURPOSE_ENROLL_FOR_VERIFICATION_ONLY	for Verification(Only)
NBioAPI_FIR_PURPOSE_ENROLL_FOR_IDENTIFICATION_ONLY	for Identification(Only)
NBioAPI_FIR_PURPOSE_AUDIT	for Audit (currently not used)
NBioAPI_FIR_PURPOSE_UPDATE	for Update (currently not used)

[NBioAPI_FIR_PURPOSE Values]

If, for example, the purpose is NBioAPI_FIR_PURPOSE_VERIFY, the verification wizard window will be displayed to users.

```
NBioAPI_RETURN ret;
NBioAPI_FIR_PURPOSE m_Purpose;
m_Purpose = NBioAPI_FIR_PURPOSE_VERIFY;

ret = NBioAPI_Capture(
  g_hBSP,                    // Handle of NBioBSP Module
  m_Purpose,                 // Purpose of capture
  &g_hCapturedFIR,           // Handle of captured FIR
  10000,                  // Capture timeout
  NULL,                   // Audit data
  NULL                    // Window option
);
```

After the fingerprint capture process is completed, the FIR or Text-encoded FIR can be retrieved from the FIR Handle using NBioAPI_GetFIRFromHandle() or NBioAPI_GetTextFIRFromHandle(). To transmit the fingerprint data on a network, the FIR data should be converted to a binary stream form.

3.6.2 Verification on a Server System

While the NBioAPI_Verify() function is used to match the live fingerprint data against the previously enrolled FIR data, the NBioAPI_VerifyMatch() is used to match the FIR data transmitted on a network against the previously enrolled FIR data.
Therefore, NBioAPI_VerifyMatch() function takes two FIRs, the transmitted FIR data and the enrolled FIR data.

```
NBioAPI_RETURN  ret;
NBioAPI_INPUT_FIR  storedFIR,  inputFIR;
NBioAPI_FIR fir1, fir2;
NBioAPI_BOOL result;

// Read stored data and convert into FIR(fir1)

storedFIR.Form = NBioAPI_FIR_FORM_FULLFIR;  // stored FIR
storedFIR.InputFIR.FIR = &fir1;

// Read input stream and convert into FIR(fir2)

inputFIR.Form = NBioAPI_FIR_FORM_FULLFIR;  // input FIR to be compared
inputFIR.InputFIR.FIR = &fir2;


ret = NBioAPI_VerifyMatch( // Matching use with stored FIR
  g_hBSP,                 // Handle of NBioBSP module
  &storedFIR,             // stored FIR
  &inputFIR,              // input FIR for matching
  &result,                // Result of matching
  &payload                // Payload
);

if ( result  == NBioAPI_TRUE)
  // Matching success
```

3.7 Payload

No two fingerprint samples from a user are likely to be identical. For this reason, it is not possible to directly use the fingerprint samples as cryptographic keys. NBioBSP does, however, allows a template to be closely bound to a cryptographic key. In the enrollment process, the fingerprint data can contain a cryptographic key, and when the verification is successfully done, the key will be released. The cryptographic key that is stored within the FIR is called Payload. Payload can also be any other information such as a password or a user name.

The "Payload" can be retrieved after successful fingerprint verification using the NBioAPI_Verify() or NBioAPI_VerifyMatch() function. With this function, any data can be transmitted securely.

Member	Description
Length	Length of payload
Data	payload data

[NBioAPI_FIR_PAYLOAD Structure]

3.7.1 Inserting Payload

There are two ways of inserting Payload into the FIR: by using either the NBioAPI_Enroll() or the NBioAPI_CreateTemplate () function.
To insert Payload when creating the FIR by using NBioAPI_Enroll(), populate the NBioAPI_FIR_PAYLOAD structure.
The first member is the length of Payload, the second member is the actual data.

```
char *temp = "Test Payload";       // data used as a payload
NBioAPI_FIR_PAYLOAD        payload;

payload.Length = lstrlen(temp) + 1;  // fill payload structure
payload.Data = new NBioAPI_UINT8 [payload.Length];
memcpy(payload.Data, temp, payload.Length);

ret = NBioAPI_Enroll(
  g_hBSP,                    // NBioBSP Handle
  NULL,                      // Stored Template
  &g_hEnrolledFIR,           // Handle of enrolled FIR
  &payload,                          // Input payload
  10000,                     // Capture timeout ( ms )
  NULL,                      // Audit data
  NULL                       // Windows options.
);
delete [] payload.Data;
```

Using NBioAPI_CreateTemplate() function can insert Payload by updating the existing FIR.

```
char *m_szPayload = "Test Payload";        // Data to be used as a payload
NBioAPI_INPUT_FIR          inputFIR;                // Input FIR
NBioAPI_FIR_PAYLOAD        payload;

inputFIR.Form = NBioAPI_FIR_FORM_HANDLE;      // Set type of input FIR
inputFIR.InputFIR.FIRinBSP = &g_hEnrolledFIR; // Copy FIR to input FIR

payload.Length = lstrlen(m_szPayload) + 1;        // Set payload length
payload.Data = new NBioAPI_UINT8 [payload.Length]; // Set payload data
memcpy(payload.Data, m_szPayload, payload.Length);

// Create new template that include payload
ret = NBioAPI_CreateTemplate(g_hBSP, &inputFIR, NULL, &g_hNewTemplate, &payload);

delete[] payload.Data;

NBioAPI_FreeFIRHandle(g_hBSP, g_hEnrolledFIR);      // Delete original FIR
g_hEnrolledFIR = g_hNewTemplate; // Overwrite original FIR with new FIR
g_hNewTemplate = 0;
```

▣ **Note :** NBioAPI_CreateTemplate(g_hBSP, &inputFIR, &storedTemplate, &g_hNewTemplate, &payload);

Priority to apply the payload

1. payload
2. inputFIR's payload

inputFIR's payload	storedTemplate's payload	payload	g_hNewTemplate's payload
YES	YES	YES	payload
YES	YES	NULL	inputFIR's payload
YES	NULL	YES	payload
YES	NULL	NULL	inputFIR's payload
NULL	YES	YES	payload
NULL	YES	NULL	NULL
NULL	NULL	YES	payload
NULL	NULL	NULL	NULL

3.7.2 Retrieving Payload from the Template

Both the NBioAPI_Verify() and the NBioAPI_VerifyMatch() functions return the payload when (1) the FIR data contains payload data, and (2) the verification is successful.

```
NBioAPI_FIR_PAYLOAD payload;
if ( g_hBSP != NBioAPI_INVALID_HANDLE )       // Check NBioBSP handle
     ret = NBioAPI_Verify(
          g_hBSP,                        // Handle of NBioBSP module
          &inputFIR,                     // Stored FIR
          &result,                       // Matching Result
          &payload,                              // Payload in FIR
          10000,                         // Capture timeout
          NULL,                          // Audit data
          NULL                           // Window option
);

if ( result  == NBioAPI_TRUE)
{
  if (payload.Length > 0)  // payload exists
  {
     CString msg;
     msg.Format("Verified !!! (Payload : %s)", (LPTSTR)payload.Data);
     MessageBox(msg);
     NBioAPI_FreePayload(g_hBSP, &payload); // must be freed
  }
}
```

3.8 Load Resource File

The NBioBSP dialogs for fingerprint enrollment and verification are designed to use skin resource files. In order to display customized UI for these dialogs, the skin resource DLL files need to created and installed by developers. The resource DLL can be loaded by using the NBioAPI_SetSkinResource() function.

External resource DLLs can also be loaded for additional language support. The default resource is English. NBioBSP SDK provides English (NBSP2Eng.dll), Korean (NBSP2Kor.dll) and Japanese (NBSP2Jpn.dll) resource files.

```
NBioAPI_SetSkinResource("NBSP2Kor.dll");
```

Note: The document for customization of UI is provided separately.

3.9 UI Properties

The NBioBSP module provides the UI functions to customize the UI properties in the NBioAPI_WINDOW_OPTION structure.
This structure can be configured and entered for the parameter of the Enroll, Verify or Capture function.

3.9.1 NBioAPI_WINDOW_OPTION Structure

```
typedef struct nbioapi_window_option {
         NBioAPI_UINT32          Length;
         NBioAPI_WINDOW_STYLE    WindowStyle;
         NBioAPI_HWND            ParentWnd;
         NBioAPI_HWND            FingerWnd;
         NBioAPI_CALLBACK_INFO_0 CaptureCallBackInfo;
         NBioAPI_CALLBACK_INFO_1 FinishCallBackInfo;
         NBioAPI_CHAR_PTR                CaptionMsg;
         NBioAPI_CHAR_PTR                CancelMsg;
         NBioAPI_UINT32          Reserved;
} NBioAPI_WINDOW_OPTION, *NBioAPI_WINDOW_OPTION_PTR;
```

■ **Length :**

Size of the NBioAPI_WINDOW_OPTION structure.

■ **WindowStyle :**

This value can be used to change the window style of the NBioBSP dialogs. The OR'd mask in high 2 bytes can also be set for the window style.

```
#define NBioAPI_WINDOW_STYLE_POPUP              (0)
#define NBioAPI_WINDOW_STYLE_INVISIBLE          (1)
#define NBioAPI_WINDOW_STYLE_CONTINUOUS         (2)
#define NBioAPI_WINDOW_STYLE_NO_FPIMG           (0x10000)
#define NBioAPI_WINDOW_STYLE_TOPMOST            (0x20000)
#define NBioAPI_WINDOW_STYLE_NO_WELCOME         (0x40000)
#define NBioAPI_WINDOW_STYLE_NO_TOPMOST         (0x80000)
```

■ **ParentWnd :**

A handle of parent window.

■ **FingerWnd :**

A window handle of the fingerprint image control. This value is only used when calling the NBioAPI_Capture() function with the NBioAPI_WINDOW_STYLE_INVISIBLE option.

■ **CaptureCallBackInfo :**

This set of callback functions is notified when the device captures each fingerprint image. It can be used after calling the NBioAPI_Capture() function.

■ **FinishCallBackInfo :**

This set of callback functions is notified when NBioBSP dialogs are closed.

■ **CaptionMsg :**

Message text displayed on the caption of the message box that prompts when canceling the enrollment dialog.

■ **CancelMsg :**

Message text displayed on the message box that prompts when canceling the enrollment dialog.

■ **Reserved :**

Not used.

3.9.2 NBioAPI_CALLBACK_INFO Structure

```
typedef struct nbioapi_callback_info_0 {
        NBioAPI_UINT32 CallBackType;
        NBioAPI_WINDOW_CALLBACK_0 CallBackFunction;
        NBioAPI_VOID_PTR UserCallBackParam;
} NBioAPI_CALLBACK_INFO_0, *NBioAPI_CALLBACK_INFO_PTR_0;

typedef struct nbioapi_callback_info_1 {
        NBioAPI_UINT32 CallBackType;
        NBioAPI_WINDOW_CALLBACK_1 CallBackFunction;
        NBioAPI_VOID_PTR UserCallBackParam;
} NBioAPI_CALLBACK_INFO_1, *NBioAPI_CALLBACK_INFO_PTR_1;
```

■ **CallBackType :**

Indicates the type of callback functions. A value of 0 indicates that the CaptureCallback function receives a NBioAPI_WINDOW_CALLBACK_PARAM_0 structure for the first parameter, and a value of 1 indicates the FinishCallback is notified for a NBioAPI_WINDOW_CALLBACK_PARAM_1 structure.

```
typedef struct nbioapi_window_callback_param_0 {
        NBioAPI_UINT32 dwQuality;
        NBioAPI_UINT8* lpImageBuf;
        NBioAPI_WINDOW_CALLBACK_PARAM_PTR_EX  pParamEx;
} NBioAPI_WINDOW_CALLBACK_PARAM_0;

typedef struct nbioapi_window_callback_param_1 {
        NBioAPI_UINT32 dwResult;
        NBioAPI_VOID_PTR lpReserved;
} NBioAPI_WINDOW_CALLBACK_PARAM_1;
```

■ **CallBackFunction :**

Specifies the name of the callback function. The function definition is as follows.

```
typedef NBioAPI_RETURN (WINAPI* NBioAPI_WINDOW_CALLBACK_0)
         (NBioAPI_WINDOW_CALLBACK_PARAM_PTR_0, NBioAPI_VOID_PTR);

typedef NBioAPI_RETURN (WINAPI* NBioAPI_WINDOW_CALLBACK_1)
         (NBioAPI_WINDOW_CALLBACK_PARAM_PTR_1, NBioAPI_VOID_PTR);
```

■ **UserCallBackParam:**

Specifies the application parameter for callback functions. The second parameter indicates the pointer to it.

3.9.3 WINDOWS OPTION Examples

The following examples show how to apply the NBioAPI_WINDOW_OPTION structure into the NBioBSP functions. Set the window option for the function parameter.

```
NBioAPI_WINDOW_OPTION m_WinOption;

memset(&m_WinOption, 0, sizeof(NBioAPI_WINDOW_OPTION));
m_WinOption.Length = sizeof(NBioAPI_WINDOW_OPTION);

...
NBioAPI_WINDOW_OPTION setting
...

ret = NBioAPI_Capture(
        m_hNBioBSP,              // Handle of NBioBSP module
        NBioAPI_FIR_PURPOSE_VERIFY,      // Purpose for capture
        &hCapturedFIR,           //
        -1,
        NULL,
        &m_WinOption             // Windows options
);
```

or

```
ret = NBioAPI_Verify(
        m_hNBioBSP,              // Handle of NBioBSP module
        &inputFIR,               // Stored FIR
        &result,                         // Result of verification
        NULL,                    // Payload in FIR
        -1,                      // Timeout for scanning image
        NULL,                    // Audit data
        &m_WinOption             // Windows options
);
```

or

```
ret = NBioAPI_Enroll(
        m_hNBioBSP,              // Handle of NBioBSP module
        NULL,                    // Stored FIR
        &hEnrolledFIR,           // Handle of FIR to be Enrolled
        NULL,                    // Input payload
        -1,                      // Capture timeout
        NULL,
        &m_WinOption             // Windows options
);
```

3.10 How to get NFIQ information

Provides with three API to support NIST Fingerprint Image Quality.

- API to get NFIQ information using AUDIT information
- API to get NFIQ information using RAW data
- API to get NFIQ information using FIR handle

NFIQ value ranges from 1(lowest quality) to 5(highest quality).

3.10.1 How to get NFIQ information using AUDIT (Fingerprint Image) information

To get AuditFIR using NBioAPI_Capture() and NBioAPI_Enroll()API, you can get NBioAPI_EXPORT_AUDIT_DATA by using NBioAPI_NBioBSPToImage(), and the API which is used in obtaining NFIQ information by using NBioAPI_EXPORT_AUDIT_DATA is NBioAPI_GetNFIQInfo().
NBioAPI_EXPORT_AUDIT_DATA is N number of fingerprint image information, which has N number of NFIQ information, and NIFQ information can be obtained using NBioAPI_QUALITY_INFO_0 structure.

```
NBioAPI_Capture( m_hBSP, NBioAPI_FIR_PURPOSE_VERIFY, &m_hCaptureFIR, -1, &m_hCaptureAuditFIR, NULL );

NBioAPI_INPUT_FIR inputFIR;
inputFIR.Form = NBioAPI_FIR_FORM_HANDLE;
inputFIR.InputFIR.FIRinBSP = m_hCaptureAuditFIR;

NBioAPI_EXPORT_AUDIT_DATA exportAuditData;
NBioAPI_NBioBSPToImage(m_hBSP, &inputFIR, &exportAuditData);

NBioAPI_QUALITY_INFO_0 qualityInfo0
nRet = NBioAPI_GetNFIQInfo(&exportAuditData, &qualityInfo0);
```

3.10.2 How to get NFIQ information using RAW data

To get NFIQ information using one fingerprint image information, you can use NBioAPI_GetNFIQInfoFromRaw() API.

```
NBioAPI_SINT32 nNfiq
NBioAPI_GetNFIQInfoFromRaw(ImageRawData, ImageWidth, ImageHeight, &nNfiq);
```

3.10.3 How to get NFIQ information using FIR handle

To get NIFQ information using FIR handle, not image information, you can use NBioAPI_GetNFIQInfoFromHandle() API.
NIFQ value can be obtained using NBioAPI_NBioBSPToImage() structure, same as using AUDIT information.

```
NBioAPI_Capture( m_hBSP, NBioAPI_FIR_PURPOSE_VERIFY, &m_hCaptureFIR, -1, &m_hCaptureAuditFIR, NULL );

NBioAPI_QUALITY_INFO_0 qualityInfo0
NBioAPI_GetNFIQInfoFromHandle(m_hBSP, m_hCaptureAuditFIR, &qualityInfo0);
```

3.10.4 How to use NBioAPI_QUALITY_INFO_0 structure

To get N number of fingerprint image information, you can use NBioAPI_QUALITY_INFO_0 structure which is defined in NBioAPI_Type.h.

```
typedef NBioAPI_UINT8   NBioAPI_QUALITY;
typedef struct nbioapi_quality_info_0
{
   NBioAPI_UINT8    StructureType;
   NBioAPI_QUALITY  Quality[NBioAPI_FINGER_ID_MAX][2];
   NBioAPI_UINT32   Reserved[4];
} NBioAPI_QUALITY_INFO_0, * NBioAPI_QUALITY_INFO_PTR_0;
```

NFIQ value is stored in a Quality array. The Quality array is two-dimensional array of 11 rows and 2 columns. The first one specifies Finger ID and the second one means Sample Num.

Finger ID is defined as below; In the case that Finger ID is unknown like Capture NFIQ value is stored in Quality[0], and in the case that FingerID is known like Enroll the NFIQ value is stored from Quality[1] to Quality[10].

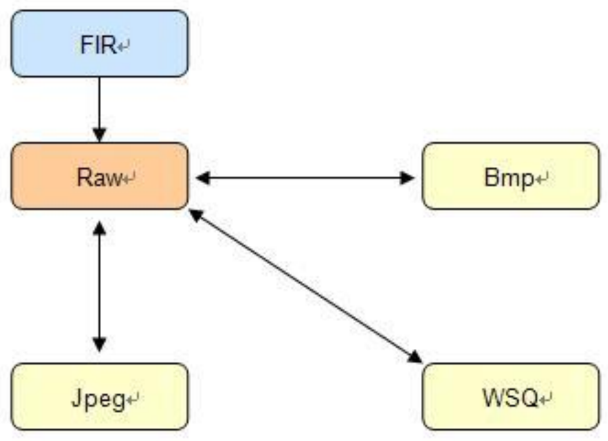
```
#define NBioAPI_FINGER_ID_UNKNOWN        (0)
#define NBioAPI_FINGER_ID_RIGHT_THUMB     (1)
#define NBioAPI_FINGER_ID_RIGHT_INDEX     (2)
#define NBioAPI_FINGER_ID_RIGHT_MIDDLE    (3)
#define NBioAPI_FINGER_ID_RIGHT_RING      (4)
#define NBioAPI_FINGER_ID_RIGHT_LITTLE    (5)
#define NBioAPI_FINGER_ID_LEFT_THUMB      (6)
#define NBioAPI_FINGER_ID_LEFT_INDEX      (7)
#define NBioAPI_FINGER_ID_LEFT_MIDDLE     (8)
#define NBioAPI_FINGER_ID_LEFT_RING       (9)
#define NBioAPI_FINGER_ID_LEFT_LITTLE     (10)
#define NBioAPI_FINGER_ID_MAX            (11)
```

3.11 Image Format Conversion

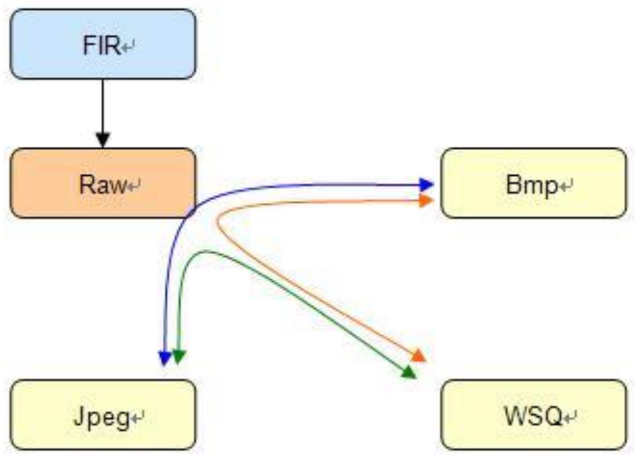
Provides with API to convert from RAW image to BMP, Jpeg, and WSQ formats.

Format	Method
Raw Buffer → Bmp Buffer	NBioAPI_ImgConvRawToBmpBuf, NBioAPI_ImgConvRawToBmpBufEx
Bmp Buffer → Raw Buffer	NBioAPI_ImgConvBmpToRawBuf, NBioAPI_ImgConvBmpToRawBufEx
Raw Buffer → Jpeg Buffer	NBioAPI_ImgConvRawToJpgBuf, NBioAPI_ImgConvRawToJpgBufEx
Jpeg Buffer → Raw Buffer	NBioAPI_ImgConvJpgToRawBuf
Raw Buffer → WSQ Buffer	NBioAPI_ImgConvRawToWSQBuf
WSQ Buffer → Raw Buffer	NBioAPI_ImgConvWSQToRawBuf

Each image can be converted from its initial format from FIR. Current Buffer is given on the basis that it is converted to Buffer.
A few formats can be converted interchangeably from Raw image as follows.



To convert between other formats, not from its initial format, you can convert them on the basis of Raw image. For example, you can use NBioAPI_ImgConvBmpToRawBuf and NBioAPI_ImgConvRawToJpgBuf to convert BMP to Jpeg.



3.12 ISO 19794-4 Format Conversion

Provides with API for conversion to support ISO 19794-4 data.

- Fingerprint Image Information → ISO Buffer: NBioAPI_ExportRawToISOV1, NBioAPI_ExportRawToISOV2
- ISO Buffer → Raw Buffer: NBioAPI_ImportISOToRaw
- Resource return: NBioAPI_FreeExportISOData, NBioAPI_FreeImportRawSet

In case of using API to support ISO 19794-4 data, you must return resource. Functions regarding resource return by API are as follows.

API for format conversion	API for resource return
NBioAPI_ExportRawToISOV1	NBioAPI_FreeExportISOData
NBioAPI_ExportRawToISOV2	
NBioAPI_ExportRawToANSIV1	
NBioAPI_ExportRawToANSIV2	
NBioAPI_ImportISOToRaw	NBioAPI_FreeImportRawSet
NBioAPI_ImportANSIToRaw	

- Example1: Return NBioAPI_FreeExportISOData as resource

```
NBioAPI_UINT8* pISOBuf = 0;
NBioAPI_ExportRawToISOV1(&exportAuditData, &pISOBuf, &nISOBufLen, FALSE, NEXPORT_COMPRESS_MOD_NONE);
NBioAPI_FreeExportISOData(pISOBuf);
```

- Example2: Return NBioAPI_FreeImportRawSet as resource

```
NIMPORTRAWSET importRawSet;
NBioAPI_ImportISOToRaw(pISOBuf, nISOBufLen, &importRawSet);
NBioAPI_FreeImportRawSet(&importRawSet);
```

Appendix A. NBioAPI API Specification

A.1 Terminology

The following abbreviated terms are used in the chapter.

BSP	Biometric Service Provider
FIR	Fingerprint Identification Record
BIR	Biometric Identification Record
FAR	False Acceptance Rate
FRR	False Rejection Rate
API	Application Programming Interface
PIN	Personal Identification Number
GUI	Graphic User Interface
OTP	One Time Password
OTT	One Time Template
UUID	Universally Unique Identifier

A.2 Data Structures

A.2.1 Basic Type Definitions

NBioAPI

```
#define   NBioAPI   __stdcall
```

NBioAPI_SINT8

```
typedef   __int8   NBioAPI_SINT8;
```

NBioAPI_SINT16

```
typedef   __int16   NBioAPI_SINT16;
```

NBioAPI_SINT32

```
typedef   int   NBioAPI_SINT32;
```

NBioAPI_UINT8

```
typedef   BYTE   NBioAPI_UINT8;
```

NBioAPI_UINT16

```
typedef   WORD   NBioAPI_UINT16;
```

NBioAPI_UINT32

```
typedef   DWORD   NBioAPI_UINT32;
```

NBioAPI_UINT64

```
typedef   __int64   NBioAPI_UINT64;
```

NBioAPI_SINT

```
typedef   INT_PTR   NBioAPI_SINT;
```

NBioAPI_UINT

```
typedef   UINT_PTR   NBioAPI_UINT;
```

NBioAPI_VOID_PTR

```
typedef   void*   NBioAPI_VOID_PTR;
```

NBioAPI_BOOL

```
typedef   BOOL   NBioAPI_BOOL;
```

NBioAPI_CHAR

```
typedef   CHAR   NBioAPI_CHAR;
```

NBioAPI_CHAR_PTR

```
typedef   LPSTR   NBioAPI_CHAR_PTR;
```

NBioAPI_FALSE

```
#define   NBioAPI_FALSE          (0)
```

NBioAPI_TRUE

```
#define   NBioAPI_TRUE           (!NBioAPI_FALSE)
```

NBioAPI_NULL

```
#define   NBioAPI_NULL           (NULL)
```

NBioAPI_HWND

```
typedef   HWND   NBioAPI_HWND;
```

A.2.2 Data Structures & Type Definitions

A.2.2.1 NBioAPI_Type.h

NBioAPI_FIR_VERSION

```
typedef    NBioAPI_UINT16    NBioAPI_FIR_VERSION;
```

NBioAPI_VERSION

```
typedef struct nbioapi_version
{
    NBioAPI_UINT32          Major;
    NBioAPI_UINT32          Minor;          /* (Example) v3.12 (Build No.34) : Major = 3, Minor = 1234 */
} NBioAPI_VERSION, *NBioAPI_VERSION_PTR;
```

NBioAPI_FIR_DATA_TYPE

```
typedef NBioAPI_UINT16          NBioAPI_FIR_DATA_TYPE;
#define     NBioAPI_FIR_DATA_TYPE_RAW                       (0x00)
#define     NBioAPI_FIR_DATA_TYPE_INTERMEDIATE              (0x01)
#define     NBioAPI_FIR_DATA_TYPE_PROCESSED                 (0x02)
#define     NBioAPI_FIR_DATA_TYPE_ENCRYPTED                 (0x10)
#define     NBioAPI_FIR_DATA_TYPE_LINEPATTERN               (0x20)
```

Description

Mask bits that may be OR'd together to indicate the type of opaque data in the FIR. (Raw OR Intermediate OR Processed) OR Encrypted.

NBioAPI_FIR_PURPOSE

The NBioAPI_FIR_PURPOSE data type is used to indicate the purpose of FIR data.

```
typedef NBioAPI_UINT16                                                  NBioAPI_FIR_PURPOSE;
#define NBioAPI_FIR_PURPOSE_VERIFY                               (0x01)
#define NBioAPI_FIR_PURPOSE_IDENTIFY                                    (0x02)
#define NBioAPI_FIR_PURPOSE_ENROLL                                      (0x03)
#define NBioAPI_FIR_PURPOSE_ENROLL_FOR_VERIFICATION_ONLY         (0x04)
#define NBioAPI_FIR_PURPOSE_ENROLL_FOR_IDENTIFICATION_ONLY              (0x05)
#define NBioAPI_FIR_PURPOSE_AUDIT                                (0x06)
#define NBioAPI_FIR_PURPOSE_UPDATE                                      (0x10)
```

NBioAPI_FIR_QUALITY

```
typedef    NBioAPI_UINT16          NBioAPI_FIR_QUALITY;
```

NBioAPI_FIR_HEADER

```
typedef struct nbioapi_fir_header
{
        NBioAPI_UINT32              Length;             /* 4Byte */
        NBioAPI_UINT32              DataLength;         /* 4Byte */
        NBioAPI_FIR_VERSION         Version;            /* 2Byte */
        NBioAPI_FIR_DATA_TYPE       DataType;           /* 2Byte */
        NBioAPI_FIR_PURPOSE         Purpose;            /* 2Byte */
        NBioAPI_FIR_QUALITY         Quality;            /* 2Byte */
        NBioAPI_UINT32              Reserved;           /* 4Byte */
} NBioAPI_FIR_HEADER, *NBioAPI_FIR_HEADER_PTR;
```

Description

The NBioAPI_FIR_HEADER structure contains information about the FIR data, including the data length, version and data type.

Members

Length:

Size, in bytes, of the structure.

DataLength:

Size, in bytes, of the FIR data.

Version:

A value indicating the version of FIR data. If the format of FIR has been changed, the version will be increased.

Data Type:

A value indicating the FIR data type. (Raw, Intermediate, or Processed)

Purpose:

A value indicating the purpose of using the FIR data. (Enroll, Verify, or Identify)

Quality:

A value indicating the quality of a fingerprint image, ranging 1 to 100.

Reserved:

Not used.

NBioAPI_FIR_DATA

```
typedef    NBioAPI_UINT8    NBioAPI_FIR_DATA;
```

Description

The NBioAPI_FIR_DATA data type is used to represent the pointer to opaque FIR data buffer. The data type of FIR may differ from the NBioAPI_FIR_DATA_TYPE in the NBioAPI_FIR_HEADER structure.

NBioAPI_FIR_FORMAT

```
typedef NBioAPI_UINT32    NBioAPI_FIR_FORMAT;
#define NBioAPI_FIR_FORMAT_STANDARD                    (1)
#define NBioAPI_FIR_FORMAT_NBAS                        (2)
#define NBioAPI_FIR_FORMAT_EXTENSION                   (3)
#define NBioAPI_FIR_FORMAT_STANDARD_AES                (4)
#define NBioAPI_FIR_FORMAT_STANDARD_3DES               (5)
#define NBioAPI_FIR_FORMAT_STANDARD_256AES             (6)
```

NBioAPI_FIR

```
typedef struct nbioapi_fir
{
        NBioAPI_FIR_FORMAT          Format;     /* NBioBSP_Standard = 1 */
        NBioAPI_FIR_HEADER          Header;
        NBioAPI_FIR_DATA*           Data;       /* Fingerprint data */
} NBioAPI_FIR, *NBioAPI_FIR_PTR;
```

Description

The NBioAPI_FIR structure contains information about the fingerprint input record (FIR), including the format, header and FIR data. This structure can contain raw sample data, partially processed (intermediate) data or completely processed data, depending on the data type specified in the DataType member of the NBioAPI_FIR_HEADER structure. The opaque FIR data, of variable length, can be used on both fingerprint enrollment and verification, and also include more information such as signature.

Members

Format:

A value indicating the FIR data format. The FIR header and data must be used depending on the FIR format. The default is NBioAPI_FIR_FORMAT_STANDARD.

Header:

Specifies a NBioAPI_FIR_HEADER structure that contain information about the FIR header. Refer to the NBioAPI_FIR_HEADER structure for more information.

FPData:

Pointer to a NBioAPI_FIR_DATA that specifies actual FIR data. The data size can be read from the DataLength member of the NBioAPI_FIR_HEADER structure.

NBioAPI_FIR_PAYLOAD

```
typedef struct nbioapi_fir_payload
{
        NBioAPI_UINT32              Length;
        NBioAPI_UINT8*              Data;
} NBioAPI_FIR_PAYLOAD, *NBioAPI_FIR_PAYLOAD_PTR;
```

Description

The NBioAPI_FIR_PAYLOAD structure can be used to provide payload data.

Members

Length:

Size, in bytes, of Data buffer.

Data:

A pointer to the payload data.

NBioAPI_HANDLE

A handle to refer to the NBioBSP module.

```
typedef   NBioAPI_UINT32                NBioAPI_HANDLE;
typedef   NBioAPI_UINT32*               NBioAPI_HANDLE_PTR;
#define   NBioAPI_INVALID_HANDLE        (0)
```

NBioAPI_FIR_HANDLE

A handle to refer to FIR data that exists in the service provider.

```
typedef   NBioAPI_UINT32          NBioAPI_FIR_HANDLE;
typedef   NBioAPI_UINT32*         NBioAPI_FIR_HANDLE_PTR;
```

NBioAPI_FIR_SECURITY_LEVEL

```
typedef NBioAPI_UINT32     NBioAPI_FIR_SECURITY_LEVEL;
#define NBioAPI_FIR_SECURITY_LEVEL_LOWEST             (1)
#define NBioAPI_FIR_SECURITY_LEVEL_LOWER              (2)
#define NBioAPI_FIR_SECURITY_LEVEL_LOW                (3)
#define NBioAPI_FIR_SECURITY_LEVEL_BELOW_NORMAL       (4)
#define NBioAPI_FIR_SECURITY_LEVEL_NORMAL             (5)
#define NBioAPI_FIR_SECURITY_LEVEL_ABOVE_NORMAL       (6)
#define NBioAPI_FIR_SECURITY_LEVEL_HIGH               (7)
#define NBioAPI_FIR_SECURITY_LEVEL_HIGHER             (8)
#define NBioAPI_FIR_SECURITY_LEVEL_HIGHEST            (9)
```

NBioAPI_INIT_INFO_0

```
typedef struct nbioapi_init_info_0
{
        NBioAPI_UINT32      StructureType;          /* must be 0 */
        NBioAPI_UINT32      MaxFingersForEnroll;    /* Default = 10 */
        NBioAPI_UINT32      SamplesPerFinger;       /* Default = 2 : not used */
        NBioAPI_UINT32      DefaultTimeout;         /* default = 10000 ms = 10sec */
        NBioAPI_UINT32      EnrollImageQuality;     /* default = 50 */
        NBioAPI_UINT32      VerifyImageQuality;     /* default = 30 */
        NBioAPI_UINT32      IdentifyImageQuality;   /* default = 50 */
        NBioAPI_FIR_SECURITY_LEVEL   SecurityLevel; /* Default = NBioAPI_FIR_SECURITY_LEVEL_NORMAL */
} NBioAPI_INIT_INFO_0, *NBioAPI_INIT_INFO_PTR_0;
```

Description

This structure contains information about the initial settings of the NBioAPI module. If another type of initial information is needed on later version of the NBioBSP, the NBioAPI_INIT_INFO_1 structure will be added.

Members

StructureType:

A value indicating the type of the structure. Must be set to 0 only at this version.

MaxFingersForEnroll:

A value indicating the number of fingers that can be enrolled. The default value is 10.

SamplesPerFinger:

This read-only member specifies the number of samples used per each finger. The default value is 2

DefaultTimeout:

This value, in millisecond, specifies the waiting time to capture fingerprint images from the device. The default is 10000, 10 seconds.

EnrollImageQuality:

This value can be used to set the threshold of image quality on enrollment, ranging 30 to 100. The default is 50, 100 is the highest.

VerifyImageQuality:
This value can be used to set the threshold of image quality on verification, ranging 30 to 100. The default is 30, 100 is the highest.

IdentifyImageQuality:
This value is used to set the threshold of image quality on identification, ranging 0 to 100. The default value is 50, 100 is the highest.

SecurityLevel:
The security level for fingerprint verification and identification, ranging 1 to 9. The default is 5, 9 is the highest. The higher the security level is set, the higher FRR and the lower FAR will be applied.

NBioAPI_INIT_INFO_1

```
typedef struct nbioapi_init_info_1
{
        NBioAPI_UINT32      StructureType;                  /* must be 1 */
        NBioAPI_FIR_SECURITY_LEVEL   SecurityLevelForEnroll     /* Default = NBioAPI_FIR_SECURITY_LEVEL_NORMAL */
        NBioAPI_UINT32      NecessaryEnrollNum;             /* Default = 0 : Depends on MaxFingersForEnroll */
        NBioAPI_UINT32      Reserved1;                      /* Reserved */
NBioAPI_UINT32      Reserved2;                      /* Reserved */
        NBioAPI_UINT32      Reserved3;                      /* Reserved */
        NBioAPI_UINT32      Reserved4;                      /* Reserved */
        NBioAPI_UINT32      Reserved5;                      /* Reserved */
        NBioAPI_UINT32      Reserved6;                      /* Reserved */
        NBioAPI_UINT32      Reserved7;                      /* Reserved */
} NBioAPI_INIT_INFO_1, *NBioAPI_INIT_INFO_PTR_1;
```

Description
This structure contains additional information about the initial settings of the NBioAPI module. If another type of initial information is needed on later version of the NBioBSP, the NBioAPI_INIT_INFO_2 structure will be added.

Members
StructureType:
A value indicating the type of the structure. Must be set to 1 only at this version.

SecurityLevelForEnroll:
The security level for fingerprint enrollment, ranging 1 to 9. The default is 5, 9 is the highest. The higher the security level is set, the higher FRR and the lower FAR will be applied.

NecessaryEnrollNum:
A value indicating the number of fingers that can be success enrollment.

NBioAPI_INIT_INFO_PTR

```
typedef NBioAPI_VOID_PTR      NBioAPI_INIT_INFO_PTR;
```

NBioAPI_DEVICE_INFO_0

```
typedef struct nbioapi_device_info_0
{
        NBioAPI_UINT32          StructureType;      /* must be 0 */
        NBioAPI_UINT32          ImageWidth;         /* read only */
        NBioAPI_UINT32          ImageHeight;        /* read only */
        NBioAPI_UINT32          Brightness;
        NBioAPI_UINT32          Contrast;
        NBioAPI_UINT32          Gain;
} NBioAPI_DEVICE_INFO_0, *NBioAPI_DEVICE_INFO_PTR_0;
```

Description

The NBioAPI_DEVICE_INFO_0 structure contains information about a device, including structure type, image size and brightness. This structure can be used by the GetDeviceInfo() or SetDeviceInfo() function. If another type of device information is needed on later version of the NBioBSP, the NBioAPI_DEVICE_INFO_1 structure will be added.

Members

StructureType:
A value indicating the structure type. The current version supports the NBioAPI_DEVICE_TYPE_0 (0) type only.

ImageWidth:
A value indicating the image width in pixel. This read-only value depends on the attached device.

ImageHeight:
A value indicating the image height in pixel. This read-only value depends on the attached device.

Brightness:
A value indicating the image brightness of the device, ranging 0 to 100.

Contrast:
A value indicating the image contrast of the device, ranging 0 to 100.

Gain:
A value indicating the image gain of the device.

NBioAPI_DEVICE_INFO_PTR

```
Typedef NBioAPI_VOID_PTR      NBioAPI_DEVICE_INFO_PTR;
```

Description

A void pointer type to support various types of structure.

NBioAPI_DEVICE_ID

```
typedef NBioAPI_UINT16                      NBioAPI_DEVICE_ID;
#define NBioAPI_DEVICE_ID_NONE              (0x0000)
#define NBioAPI_DEVICE_ID_AUTO              (0x00ff)
```

Description

The NBioAPI_DEVICE_ID constants represent the device IDs, including the device instance in a high byte and device name in a low byte.

NBioAPI_DEVICE_NAME

```
typedef NBioAPI_UINT8                                   NBioAPI_DEVICE_NAME;
#define NBioAPI_DEVICE_NAME_FDP02                       (0x01)
#define NBioAPI_DEVICE_NAME_FDU01                       (0x02)
#define NBioAPI_DEVICE_NAME_OSU02                       (0x03)
#define NBioAPI_DEVICE_NAME_FDU11                       (0x04)
#define NBioAPI_DEVICE_NAME_FSC01                       (0x05)
#define NBioAPI_DEVICE_NAME_FDU03                       (0x06)
#define NBioAPI_DEVICE_NAME_FDU05                       (0x07)
#define NBioAPI_DEVICE_NAME_FDU08                       (0x08)
#define NBioAPI_DEVICE_NAME_FDU09                       (0x09)

#define NBioAPI_DEVICE_NAME_ADDITIONAL                  (0x10)    /* Additional Device */
#define NBioAPI_DEVICE_NAME_ADDITIONAL_MAX              (0x9F)

#define NBioAPI_DEVICE_NAME_NND_URU4KB                  (0xA1)    /* UareU4000B */
#define NBioAPI_DEVICE_NAME_NND_FPC6410                 (0xA2)    /* FPC6410 */

#define NBioAPI_MAX_DEVICE                              (0xfe)
```

NBioAPI_RETURN

```
typedef NBioAPI_UINT32                          NBioAPI_RETURN;
```

Description

This data type is returned by all NBioAPI functions. The permitted values include:

- NBioAPIERROR_NONE: No error.
- All error values defined in the specification can be returned when the function fails.

NBioAPI_FIR_TEXTENCODE

```
typedef struct nbioapi_fir_textencode
{
        NBioAPI_BOOL                            IsWideChar;
        NBioAPI_CHAR_PTR                        TextFIR;
} NBioAPI_FIR_TEXTENCODE, *NBioAPI_FIR_TEXTENCODE_PTR;
```

Description

This structure is used to convert FIR data to text-encoded FIR data.

Members

IsWideChar :

Flag if the character set is composed of wide characters (UNICODE).

TextFIR :

A pointer to the text-encoded FIR buffer.

NBioAPI_INPUT_FIR_FORM

```
typedef   NBioAPI_UINT8                         NBioAPI_INPUT_FIR_FORM;
#define   NBioAPI_FIR_FORM_HANDLE                        (0x02)
#define   NBioAPI_FIR_FORM_FULLFIR              (0x03)
#define   NBioAPI_FIR_FORM_TEXTENCODE                    (0x04)
```

NBioAPI_INPUT_FIR

```
typedef struct nbioapi_input_fir
{
        NBioAPI_INPUT_FIR_FORM                           FIRForm;
        Union
{
                NBioAPI_FIR_HANDLE_PTR                   FIRinBSP;
                NBioAPI_VOID_PTR                         FIR;
                NBioAPI_FIR_TEXTENCODE_PTR               TextFIR;
        }InputFIR;
} NBioAPI_INPUT_FIR, *NBioAPI_INPUT_FIR_PTR;
```

Description

A structure used to input a FIR to the NBioBSP APIs. Such input can be in one of three forms; a FIR handle, an actual FIR, or a text-encoded FIR.

NBioAPI_NO_TIMEOUT

```
#define NBioAPI_NO_TIMEOUT                      (0)
```

NBioAPI_USE_DEFAULT_TIMEOUT

```
#define NBioAPI_USE_DEFAULT_TIMEOUT             (-1)
```

NBioAPI_CONTINUOUS_CAPTURE

```
#define NBioAPI_CONTINUOUS_CAPTURE              (-2)
```

NBioAPI_WINDOW_STYLE

```
typedef   NBioAPI_UINT32                            NBioAPI_WINDOW_STYLE;
#define NBioAPI_WINDOW_STYLE_POPUP                  (0)
#define NBioAPI_WINDOW_STYLE_INVISIBLE              (1)
#define NBioAPI_WINDOW_STYLE_CONTINUOUS             (2)

/* OR flag used only in high 2 bytes. */
#define NBioAPI_WINDOW_STYLE_NO_FPIMG               (0x00010000)
#define NBioAPI_WINDOW_STYLE_TOPMOST                (0x00020000)
#define NBioAPI_WINDOW_STYLE_NO_WELCOME             (0x00040000)
#define NBioAPI_WINDOW_STYLE_NO_TOPMOST             (0x00080000)
```

Description

This structure can be used to change the window style of the NBioBSP module. The OR'd mask in high 2 bytes can also be set for the window style.

- POPUP : General window popup style. This value is the default.
- INVISIBLE : No capturing dialog prompts when calling the Capture function, not for the Enroll function.
- CONTINUOUS : Starting the enrollment function hides the parent window until this function is finished, and this visual effect shows these continuous enrollment pages to be looking like in a same wizard when all pages are in same size and position. For more information, refer to the UI Test program description.
- NO_FPIMG : No fingerprint images are displayed on the window of the NBioBSP capturing dialog when calling the Capture function
- TOPMOST : Displaying the NBioBSP dialogs on the top-most window. This is default.
- NO_WELCOME : No welcome dialog is displayed when calling the Enroll function.
- NO_TOPMOST : The NBioBSP dialogs are not displayed on the top-most window.

NBioAPI_WINDOW_CALLBACK_PARAM_EX

```
typedef struct nbioapi_window_callback_param_ex
{
    NBioAPI_UINT32              dwDeviceError;
    NBioAPI_UINT32              dwReserved[8];
    NBioAPI_VOID_PTR            lpReserved;
} NBioAPI_WINDOW_CALLBACK_PARAM_EX, *NBioAPI_WINDOW_CALLBACK_PARAM_PTR_EX;
```

Description

A structure that is included in NBioAPI_WINDOW_CALLBACK_PARAM_0 structure. It contains more detail information of callback function.

NBioAPI_WINDOW_CALLBACK_PARAM_0

```
typedef struct nbioapi_window_callback_param_0
{
          NBioAPI_UINT32                            dwQuality;
          NBioAPI_UINT8*                            lpImageBuf;
NBioAPI_WINDOW_CALLBACK_PARAM_PTR_EX     pParamEx;
} NBioAPI_WINDOW_CALLBACK_PARAM_0, *NBioAPI_WINDOW_CALLBACK_PARAM_PTR_0;
```

Description

A structure that is received from a callback function when capturing fingerprints, including the fingerprint image quality and a pointer to the image buffer.

NBioAPI_WINDOW_CALLBACK_PARAM_1_1

```
typedef struct nbioapi_window_callback_param_1_1
{
        NBioAPI_UINT32              dwStartTime;
        NBioAPI_UINT32              dwCapTime;
        NBioAPI_UINT32              dwEndTime;

        NBioAPI_UINT32              Reserved1;
        NBioAPI_UINT32              Reserved2;
        NBioAPI_UINT32              Reserved3;
        NBioAPI_UINT32              Reserved4;
        NBioAPI_UINT32              Reserved5;
        NBioAPI_UINT32              Reserved6;
        NBioAPI_UINT32              Reserved7;
        NBioAPI_UINT32              Reserved8;

        NBioAPI_VOID_PTR            lpReserved;
} NBioAPI_WINDOW_CALLBACK_PARAM_1_1, *NBioAPI_WINDOW_CALLBACK_PARAM_PTR_1_1;
```

Description

A structure that is received from a callback function just before the dialog is closed, including the capture time.

NBioAPI_WINDOW_CALLBACK_PARAM_1

```
typedef struct nbioapi_window_callback_param_1
{
        NBioAPI_UINT32                              dwResult;
        NBioAPI_WINDOW_CALLBACK_PARAM_PTR_1_1       lpCBParam1_1;
} NBioAPI_WINDOW_CALLBACK_PARAM_1, *NBioAPI_WINDOW_CALLBACK_PARAM_PTR_1;
```

Description

A structure that is received from a callback function just before the dialog is closed, including the function result.

NBioAPI_WINDOW_CALLBACK_0

```
typedef NBioAPI_RETURN (WINAPI* NBioAPI_WINDOW_CALLBACK_0) (NBioAPI_WINDOW_CALLBACK_PARAM_PTR_0,
NBioAPI_VOID_PTR);
```

NBioAPI_WINDOW_CALLBACK_1

```
typedef NBioAPI_RETURN (WINAPI* NBioAPI_WINDOW_CALLBACK_1) (NBioAPI_WINDOW_CALLBACK_PARAM_PTR_1,
NBioAPI_VOID_PTR);
```

NBioAPI_WINDOW_CALLBACK_INFO_0

```
typedef struct nbioapi_callback_info
{
        NBioAPI_UINT32                   CallBackType;
        NBioAPI_WINDOW_CALLBACK_0        CallBackFunction;
        NBioAPI_VOID_PTR                 UserCallBackParam;
} NBioAPI_CALLBACK_INFO_0, *NBioAPI_CALLBACK_INFO_PTR_0;
```

NBioAPI_WINDOW_CALLBACK_INFO_1

```
typedef struct nbioapi_callback_info
{
        NBioAPI_UINT32                  CallBackType;
        NBioAPI_WINDOW_CALLBACK_1       CallBackFunction;
        NBioAPI_VOID_PTR                UserCallBackParam;
} NBioAPI_CALLBACK_INFO_1, *NBioAPI_CALLBACK_INFO_PTR_1;
```

Description

This NBioAPI_WINDOW_CALLBACK_INFO structure is to configure callback functions. This structure is used to set the NBioAPI_WINDOW_OPTION structure.

Members

CallBackType:
Indicating the type of callback functions. (0 or 1)

CallBackFunction:
The name of the callback function.

UserCallBackParam:
Application parameter of the callback function. The second parameter of callback functions indicates the pointer to this information.

NBioAPI_WINDOW_OPTION_2

```
typedef struct nbioapi_window_option_2
 {
        NBioAPI_UINT8      FPForeColor[3];
        NBioAPI_UINT8      FPBackColor[3];
        NBioAPI_UINT8      DisableFingerForEnroll[10];
        NBioAPI_UINT32     Reserved1[4];
        NBioAPI_VOID_PTR   Reserved2;
} NBioAPI_WINDOW_OPTION_2, *NBioAPI_WINDOW_OPTION_PTR_2;
```

Descriptions

This structure can be used to change the setting of the NBioBSP user interface.

Member variables

FPForeColor[3] :
Color for the fingerprint images.

FPBackColor[3] :
Color for the fingerprint background.

Note : These colors of FPForeColor[3] and FPBackColor[3] may be different from real RGB color, since they are used for internal reference only.

DisableFingerForEnroll[10] :
This array contains information about each finger to be disabled on Enroll function. The following example shows that both little fingers are disabled for enrollment.

```
        DisableFingerForEnroll [ 0 /* Right thumb */ ] = 0;
        DisableFingerForEnroll [ 1 /* Right index */ ] = 0;
        DisableFingerForEnroll [ 2 /* Right middle */ ] = 0;
        DisableFingerForEnroll [ 3 /* Right ring */ ] = 0;
        DisableFingerForEnroll [ 4 /* Right little */ ] = 1;
        DisableFingerForEnroll [ 5 /* Left thumb */ ] = 0;
        DisableFingerForEnroll [ 6 /* Left index */ ] = 0;
        DisableFingerForEnroll [ 7 /* Left middle */ ] = 0;
        DisableFingerForEnroll [ 8 /* Left ring */ ] = 0;
        DisableFingerForEnroll [ 9 /* Left little */ ] = 1;
```

Reserved1[4]
Not used.

Reserved2
Not used.

NBioAPI_WINDOW_OPTION

```
typedef struct nbioapi_window_option
{
        NBioAPI_UINT32                  Length;
        NBioAPI_WINDOW_STYLE            WindowStyle;
        NBioAPI_HWND                    ParentWnd;
        NBioAPI_HWND                    FingerWnd;              /* only for .._STYLE_INVISIBLE */
        NBioAPI_CALLBACK_INFO           CaptureCallBackInfo;    /* only for .._STYLE_INVISIBLE */
        NBioAPI_CALLBACK_INFO           FinishCallBackInfo;
        NBioAPI_CHAR_PTR                CaptionMsg;
        NBioAPI_CHAR_PTR                CancelMsg;
        NBioAPI_WINDOW_OPTION_PTR_2     Option2;                /* Default : NULL */
} NBioAPI_WINDOW_OPTION, *NBioAPI_WINDOW_OPTION_PTR;
```

Descriptions

This structure can be used to control the user interface of NBioBSP in more detail. It can be set in the parameter of the AdjustDevice, Capture, Enroll or Verify function.

Member variables

Length:
Size, in bytes, of the structure

WindowStyle:
The window style of the NBioBSP dialogs.

NBioAPI_WINDOW_STYLE_POPUP:
Popup window style. Default value.

NBioAPI_WINDOW_STYLE_INVISIBLE:
No popup window. Only used for NBioAPI_Capture() function.

NBioAPI_WINDOW_STYLE_CONTINUOUS:
Parent window will be disappered during capturing.

ParentWnd:
A handle of parent window.

FingerWnd:
A window handle of the fingerprint image control. This member is only used when calling the NBioAPI_Capture() function with NBioAPI_WINDOW_STYLE_INVISIBLE option.

CaptureCallBackInfo:
This set of callback functions is notified when the device captures each fingerprint image. The CallBackType of this structure must be 0. It can be used after calling the NBioAPI_Capture() function.

FinishCallBackInfo:

This set of callback functions is notified when NBioBSP dialogs are closed. The CallBackType of this structure must be 1.

CaptionMsg:

Message text displayed on the caption of the message box that prompts when canceling the enrollment dialog.

CancelMsg:

Message text displayed on the message box that prompts when canceling the enrollment dialog.

MINCONV_DATA_TYPE

```
enum MINCONV_DATA_TYPE
{
        MINCONV_TYPE_FDP = 0,
        MINCONV_TYPE_FDU,
        MINCONV_TYPE_FDA,
        MINCONV_TYPE_OLD_FDA,
        MINCONV_TYPE_FDAC,

        /* Below type is supported after v4.10 */
        MINCONV_TYPE_FIM10_HV,
        MINCONV_TYPE_FIM10_LV,
        MINCONV_TYPE_FIM01_HV,      /* 404bytes */
        MINCONV_TYPE_FIM01_HD,
        MINCONV_TYPE_FELICA,        /* 200bytes */

        MINCONV_TYPE_EXTENSION, /* 1024bytes */

        MINCONV_TYPE_TEMPLATESIZE_32, // 11, Currently does not support
        MINCONV_TYPE_TEMPLATESIZE_48, // Currently does not support
        MINCONV_TYPE_TEMPLATESIZE_64, // Currently does not support
        MINCONV_TYPE_TEMPLATESIZE_80, // Currently does not support
        MINCONV_TYPE_TEMPLATESIZE_96, // Currently does not support
        MINCONV_TYPE_TEMPLATESIZE_112, // Currently does not support
        MINCONV_TYPE_TEMPLATESIZE_128,
        MINCONV_TYPE_TEMPLATESIZE_144,
        MINCONV_TYPE_TEMPLATESIZE_160,
        MINCONV_TYPE_TEMPLATESIZE_176,
        MINCONV_TYPE_TEMPLATESIZE_192,
        MINCONV_TYPE_TEMPLATESIZE_208,
        MINCONV_TYPE_TEMPLATESIZE_224,
        MINCONV_TYPE_TEMPLATESIZE_240,
        MINCONV_TYPE_TEMPLATESIZE_256,
        MINCONV_TYPE_TEMPLATESIZE_272,
        MINCONV_TYPE_TEMPLATESIZE_288,
        MINCONV_TYPE_TEMPLATESIZE_304,
        MINCONV_TYPE_TEMPLATESIZE_320,
        MINCONV_TYPE_TEMPLATESIZE_336,
        MINCONV_TYPE_TEMPLATESIZE_352,
        MINCONV_TYPE_TEMPLATESIZE_368,
        MINCONV_TYPE_TEMPLATESIZE_384,
        MINCONV_TYPE_TEMPLATESIZE_400, // 34

        MINCONV_TYPE_ANSI,
        MINCONV_TYPE_ISO,

        MINCONV_TYPE_MAX
};
```

Description

The MINCONV_DATA_TYPE enumeration contains minutiae data types that can be created by NITGEN fingerprint devices. These constants are used to convert minutiae data format to one of different type. (Ex: NBioAPI_FDxToNBioBSP())

NBioAPI_FINGER_ID

Representing each finger identifier.

```
typedef NBioAPI_UINT8                              NBioAPI_FINGER_ID;
#define NBioAPI_FINGER_ID_UNKNOWN                  (0) /* for verify */
#define NBioAPI_FINGER_ID_RIGHT_THUMB              (1)
#define NBioAPI_FINGER_ID_RIGHT_INDEX              (2)
#define NBioAPI_FINGER_ID_RIGHT_MIDDLE             (3)
#define NBioAPI_FINGER_ID_RIGHT_RING               (4)
#define NBioAPI_FINGER_ID_RIGHT_LITTLE             (5)
#define NBioAPI_FINGER_ID_LEFT_THUMB               (6)
#define NBioAPI_FINGER_ID_LEFT_INDEX               (7)
#define NBioAPI_FINGER_ID_LEFT_MIDDLE              (8)
#define NBioAPI_FINGER_ID_LEFT_RING                (9)
#define NBioAPI_FINGER_ID_LEFT_LITTLE              (10)
#define NBioAPI_FINGER_ID_MAX                      (11)
```

NBioAPI_MAKEDEVICEID

```
#define NBioAPI_MAKEDEVICEID(deviceName, instanceNum) ( ((instanceNum & 0x00FF) << 8) + (deviceName & 0x00FF) )
```

NBioAPI_MATCH_OPTION_0

```
typedef struct nbioapi_match_option_0
{
        NBioAPI_UINT8           StructType; /* must be 0 */
        NBioAPI_UINT8           NoMatchFinger[NBioAPI_FINGER_ID_MAX];
        NBioAPI_UINT32          Reserved[8];
} NBioAPI_MATCH_OPTION_0, * NBioAPI_MATCH_OPTION_PTR_0;
```

Descriptions

A structure used to update the matching configuration when using matching functions.

Members

StructureType:

A value indicating the type of the structure. Must be set to 0 only at this version.

NoMatchFinger:

This value indicates a set of exclusion of target to be matched. The index value means the fingerprint number and each value includes the sample number to be excluded. For example, excluding 1st sample of right thumb and all samples of left index requires following settings.

```
NoMatchFinger[NBioAPI_FINGER_ID_RIGHT_THUMB] = 2;
        NoMatchFinger[NBioAPI_FINGER_ID_LEFT_INDEX] = 3;
```

Note that a value of 0 means to match all, 1 or 2 for excluding 1st or 2nd sample each, and 3 for excluding both samples.

Reserved:

Not used.

NBioAPI_MATCH_OPTION_PTR

```
typedef NBioAPI_VOID_PTR       NBioAPI_MATCH_OPTION_PTR;
```

NBioAPI_QUALITY

```
#define NBioAPI_QUALITY_NONE            (0)
#define NBioAPI_QUALITY_BAD             (1)
#define NBioAPI_QUALITY_POOR            (2)
#define NBioAPI_QUALITY_NORMAL          (3)
#define NBioAPI_QUALITY_GOOD            (4)
#define NBioAPI_QUALITY_EXCELLENT       (5)
typedef NBioAPI_UINT8                   NBioAPI_QUALITY;
```

NBioAPI_QUALITY_INFO_0

```
typedef struct nbioapi_quality_info_0
{
    NBioAPI_UINT8          StructureType;                         /* must be 0 */
    NBioAPI_QUALITY        Quality[NBioAPI_FINGER_ID_MAX][2];     /* NBioAPI_QUALITY : 0 ~ 5 */
    NBioAPI_UINT32         Reserved[4];
} NBioAPI_QUALITY_INFO_0, *NBioAPI_QUALITY_INFO_PTR_0;
```

NBioAPI_QUALITY_INFO_1

```
typedef struct nbioapi_quality_info_0
{
    NBioAPI_UINT8     StructureType;                         /* must be 1 */
    NBioAPI_UINT8     Quality[NBioAPI_FINGER_ID_MAX][2];     /* 0 ~ 100 */
    NBioAPI_UINT32    Reserved[4];
} NBioAPI_QUALITY_INFO_1, *NBioAPI_QUALITY_INFO_PTR_1;
```

NBioAPI_DEVICE_INFO_EX

```
typedef struct nbioapi_device_info_ex
{
        NBioAPI_DEVICE_ID  NameID;
        NBioAPI_UINT16     Instance;

        NBioAPI_CHAR       Name[64];
        NBioAPI_CHAR       Description[256];
        NBioAPI_CHAR       Dll[64];
        NBioAPI_CHAR       Sys[64];

        NBioAPI_UINT32     AutoOn;
        NBioAPI_UINT32     Brightness;
        NBioAPI_UINT32     Contrast;
        NBioAPI_UINT32     Gain;

        NBioAPI_UINT32     Reserved[8];
} NBioAPI_DEVICE_INFO_EX, *NBioAPI_DEVICE_INFO_EX_PTR;
```

Description

The NBioAPI_DEVICE_INFO_EX structure contains detail information about a device, including device name, device instance, and description. This structure can be used by the EnumerateDeviceEx() function.

Members

NameID:

A value indicating the device name ID.

Instance:
A value indicating the device Instance.

Name:
A value indecation the device name string.

Description:
A value indecation the device description string.

Dll:
A value indecation the dll file name of device driver.

Sys:
A value indecation the sys file name of device driver.

AutoOn:
A value indecation the auto on supported device. If the device can support the auto on function, this value set to 1.

Brightness:
A value indicating the image brightness of the device, ranging 0 to 100.

Contrast:
A value indicating the image contrast of the device, ranging 0 to 100.

Gain:
A value indicating the image gain of the device.

Reserved:
Not used.

A.2.2.2 NBioAPI_ExportType.h

NBioAPI_TEMPLATE_DATA

```
typedef struct nbioapi_template_data
{
        NBioAPI_UINT32      Length;         /* sizeof of structure */
        NBioAPI_UINT8*      Data[400];
} NBioAPI_TEMPLATE_DATA, *NBioAPI_TEMPLATE_DATA_PTR;
```

Descriptions

This structure contains the processed minutiae data.

Member variables

Length:

Size, in bytes, of template data.

Data[400]:

Byte array containing minutiae data.

NBioAPI_FINGER_DATA

```
typedef struct nbioapi_finger_data
{
        NBioAPI_UINT32                  Length;         /* sizeof of structure */
        NBioAPI_UINT8                   FingerID;       /* NBioAPI_FINGER_ID */
        NBioAPI_TEMPLATE_DATA_PTR       Template;
} NBioAPI_FINGER_DATA, *NBioAPI_FINGER_DATA_PTR;
```

Descriptions

This structure contains information about each finger.

Member variables

Length:

Size, in bytes, of the structure.

FingerID:

Finger identifier.

Template:

Pointer to the set of template data. The template contains as many templates as the sample count.

NBioAPI_TEMPLATE_DATA_2

```
typedef struct nbioapi_template_data_2
{
        NBioAPI_UINT32      Length;     /* just length of Data (not sizeof structure) */
        NBioAPI_UINT8*      Data;       /* variable length of data */
} NBioAPI_TEMPLATE_DATA_2, *NBioAPI_TEMPLATE_DATA_PTR_2;
```

Descriptions

This structure contains the processed minutiae data.

Member variables

Length:

Size, in bytes, of template data.

Data:
Pointer to the set of template data.

NBioAPI_FINGER_DATA_2

```
typedef struct nbioapi_finger_data_2
{
        NBioAPI_UINT32                  Length;         /* sizeof of structure */
        NBioAPI_UINT8                   FingerID;       /* NBioAPI_FINGER_ID */
        NBioAPI_TEMPLATE_DATA_PTR_2     Template;
} NBioAPI_FINGER_DATA_2, *NBioAPI_FINGER_DATA_PTR_2;
```

Descriptions
This structure contains information about each finger.

Member variables
Length:
Size, in bytes, of the structure.

FingerID:
Finger identifier.

Template:
Pointer to the set of template data.

NBioAPI_EXPORT_DATA

```
typedef struct nbioapi_export_data
{
        NBioAPI_UINT32                  Length;
        NBioAPI_UINT8                   EncryptType;
        NBioAPI_UINT8                   FingerNum;
        NBioAPI_UINT8                   DefaultFingerID;
        NBioAPI_UINT8                   SamplesPerFinger;
        NBioAPI_FINGER_DATA_PTR         FingerData;
        NBioAPI_FINGER_DATA_PTR_2       FingerData2;
} NBioAPI_EXPORT_DATA, *NBioAPI_EXPORT_DATA_PTR;
```

Descriptions
This structure is used to convert minutiae data to different format of minutiae.

Member variables
Length:
Size, in bytes, of the structure.

EncryptType:
The type of encryption of minutiae data. Ex) MINCONV_TYPE_FDU, MINCONV_TYPE_FDA, …

FingerNum:
Total number of fingers.

DefaultFingerID:
The default finger ID.

SamplesPerFinger:
The number of samples per a finger.

FingerData:
A pointer to a NBioAPI_FINGER_DATA structure, including information about processed templates. This pointer can be used when the MINCONV_DATA_TYPE is either of MINCONV_TYPE_FDP, MINCONV_TYPE_FDU, MINCONV_TYPE_FDA, or MINCONV_TYPE_OLD_FDA.

FingerData2:
A pointer to a NBioAPI_FINGER_DATA2 structure. This pointer can be used for any MINCONV_DATA_TYPE.

NBioAPI_IMAGE_DATA

```
typedef struct nbioapi_image_data
{
        NBioAPI_UINT32      Length;         /* sizeof of structure */
        NBioAPI_UINT8*      Data;
} NBioAPI_IMAGE_DATA, *NBioAPI_IMAGE_DATA_PTR;
```

Descriptions
This structure contains image data.

Member variables
Length:
Size, in bytes, of the structure.

Data:
A pointer to the image data. This data size is ImageWidth by ImageHeight specified in the NBioAPI_EXPORT_AUDIT_DATA structure.

NBioAPI_AUDIT_DATA

```
typedef struct nbioapi_audit_data
{
        NBioAPI_UINT32              Length;     /* sizeof of structure */
        NBioAPI_UINT8               FingerID;   /* NBioAPI_FINGER_ID */
        NBioAPI_IMAGE_DATA_PTR      Image;
} NBioAPI_AUDIT_DATA, *NBioAPI_AUDIT_DATA_PTR;
```

Descriptions
This structure contains information about image data of each finger.

Member variables
Length:
Size, in bytes, of the structure.

FingerID:
Finger identifier.

Image:
A pointer to a NBioAPI_AUDIT_DATA structure.

NBioAPI_EXPORT_AUDIT_DATA

```
typedef struct nbioapi_export_audit_data
{
        NBioAPI_UINT32                 Length;             /* sizeof of structure */
        NBioAPI_UINT8                  FingerNum;
        NBioAPI_UINT8                  SamplesPerFinger;
        NBioAPI_UINT32                 ImageWidth;
        NBioAPI_UINT32                 ImageHeight;
        NBioAPI_AUDIT_DATA_PTR         AuditData;
        NBioAPI_UINT32                 Reserved2;
} NBioAPI_EXPORT_AUDIT_DATA, *NBioAPI_EXPORT_AUDIT_DATA_PTR;
```

Descriptions

This structure can be used to read audit data from fingerprint.

Member variables

Length:

Size, in bytes, of the structure.

FingerNum:

Total number of fingers.

SamplesPerFinger:

The number of sample per a finger.

ImageWidth:

Image width

ImageHeight:

Image height.

AuditData:

A pointer to a NBioAPI_AUDIT_DATA structure, including audit data.

Reserved2:

Not used.

A.2.2.3 NBioAPI_IndexSearchType.h

NBioAPI_INDEXSEARCH_INIT_INFO_0

```
typedef struct nbioapi_indexsearch_init_info_0
{
        NBioAPI_UINT32          StructureType;      /* must be 0 */
        NBioAPI_UINT32          PresearchRate;      /* Default = 12 */
        NBioAPI_UINT32          Reserved0;
        NBioAPI_UINT32          Reserved1;
        NBioAPI_UINT32          Reserved2;
        NBioAPI_UINT32          Reserved3;
        NBioAPI_UINT32          Reserved4;
        NBioAPI_UINT32          Reserved5;
        NBioAPI_UINT32          Reserved6;
} NBioAPI_INDEXSEARCH_INIT_INFO_0, *NBioAPI_INDEXSEARCH_INIT_INFO_PTR_0;
```

Descriptions

This structure is used to initialize the IndexSearch engine.

Members

StructureType:

A value indicating the type of the structure. Must be set to 0 only at this version.

PresearchRate:

A value indicating the range of presearching rate. It can be set from 0 to 100, meaning percentage. The default value is 12, and generally no need to change.

NBioAPI_INDEXSEARCH_FP_INFO

```
typedef struct nbioapi_indexsearch_fp_info
{
        NBioAPI_UINT32          ID;
        NBioAPI_UINT32          FingerID;
        NBioAPI_UINT32          SampleNumber;
} NBioAPI_INDEXSEARCH_FP_INFO, *NBioAPI_INDEXSEARCH_FP_INFO_PTR;
```

Descriptions

This structure contains a user’s fingerprint information.

Members

ID:

A user’s identifier number.

FingerID:

A fingerprint number.

SampleNumber:

A fingerprint sample number.

NBioAPI_INDEXSEARCH_SAMPLE_INFO

```
typedef struct nbioapi_indexsearch_sample_info
{
        NBioAPI_UINT32                ID;
        NBioAPI_UINT32                SampleCount[11];
} NBioAPI_INDEXSEARCH_SAMPLE_INFO, *NBioAPI_INDEXSEARCH_SAMPLE_INFO_PTR;
```

Descriptions

This structure contains fingerprint template information on registration.

Members

ID:

A user's identifier number.

SampleCount:

A count of fingerprints registered for each finger.

NBioAPI_INDEXSEARCH_CALLBACK

```
typedef NBioAPI_RETURN (WINAPI* NBioAPI_INDEXSEARCH_CALLBACK_0) (NBioAPI_INDEXSEARCH_CALLBACK_PARAM_PTR_0,
NBioAPI_VOID_PTR);
```

Descriptions

This callback function is to invoke on every start of fingerprint verification during doing the IndexSearch. This function receives fingerprint information to be matched and this information can be used to determine if the verification actually needs to be performed. It also can be used to terminate the IndexSearch engine.

NBioAPI_INDEXSEARCH_CALLBACK_INFO_0

```
typedef struct nbioapi_indexsearch_callback_info_0
{
        NBioAPI_UINT32                          CallBackType;
        NBioAPI_INDEXSEARCH_CALLBACK_0          CallBackFunction;
        NBioAPI_VOID_PTR                        UserCallBackParam;
} NBioAPI_INDEXSEARCH_CALLBACK_INFO_0, *NBioAPI_INDEXSEARCH_CALLBACK_INFO_PTR_0;
```

Descriptions

This structure is to set callback functions.

Members

CallBackType:

A value of callback function type. It must be set to 0.

CallBackFunction:

A callback function name.

UserCallBackParam:

A pointer to user information of the callback function. It can be used for the second parameter of the callback function.

NBioAPI_INDEXSEARCH_CALLBACK_PARAM_0

```
typedef struct nbioapi_indexsearch_callback_param_0
{
    NBioAPI_UINT32                          TotalCount;
    NBioAPI_UINT32                          ProgressPos;
    NBioAPI_INDEXSEARCH_FP_INFO             FpInfo;
    NBioAPI_UINT32                          Reserved0;
    NBioAPI_UINT32                          Reserved1;
    NBioAPI_UINT32                          Reserved2;
    NBioAPI_UINT32                          Reserved3;
    NBioAPI_VOID_PTR                        Reserved4;
} NBioAPI_INDEXSEARCH_CALLBACK_PARAM_0, *NBioAPI_INDEXSEARCH_CALLBACK_PARAM_PTR_0;
```

Descriptions

This structure contains some information that the callback function receive on every start of fingerprint verification during the IndexSearch.

Members

TotalCount:

A template count of the target database for the IndexSearch.

ProgressPos:

A number of fingerprints already matched.

FpInfo:

A structure containing fingerprint information to be matched. It includes user ID, finger ID and template ID that can be used to determine to continue verification.

NBioAPI_INDEXSEARCH_CALLBACK Return value

```
#define NBioAPI_INDEXSEARCH_CALLBACK_OK             (0)
#define NBioAPI_INDEXSEARCH_CALLBACK_SKIP           (1)
#define NBioAPI_INDEXSEARCH_CALLBACK_STOP           (2)
```

Descriptions

Definitions of return values that returns from the IndexSearch callback function.

NBioAPI_INDEXSEARCH_CALLBACK_OK : Continue matching.

NBioAPI_INDEXSEARCH_CALLBACK_SKIP : Ignore this matching.

NBioAPI_INDEXSEARCH_CALLBACK_STOP : Stop all matching.

A.2.3 Error Constant

```
#define NBioAPIERROR_BASE_GENERAL                  (0x0000)
#define NBioAPIERROR_BASE_DEVICE                   (0x0100)
#define NBioAPIERROR_BASE_UI                       (0x0200)
#define NBioAPIERROR_BASE_NSEARCH                  (0x0300)
#define NBioAPIERROR_BASE_IMGCONV                  (0x0400)
#define NBioAPIERROR_BASE_INDEXSEARCH              (0x0500)

#define NBioAPIERROR_NONE                          (0)
#define NBioAPIERROR_INVALID_HANDLE                (NBioAPIERROR_BASE_GENERAL + 0x01)
#define NBioAPIERROR_INVALID_POINTER               (NBioAPIERROR_BASE_GENERAL + 0x02)
#define NBioAPIERROR_INVALID_TYPE                  (NBioAPIERROR_BASE_GENERAL + 0x03)
#define NBioAPIERROR_FUNCTION_FAIL                 (NBioAPIERROR_BASE_GENERAL + 0x04)
#define NBioAPIERROR_STRUCTTYPE_NOT_MATCHED        (NBioAPIERROR_BASE_GENERAL + 0x05)
#define NBioAPIERROR_ALREADY_PROCESSED             (NBioAPIERROR_BASE_GENERAL + 0x06)
#define NBioAPIERROR_EXTRACTION_OPEN_FAIL          (NBioAPIERROR_BASE_GENERAL + 0x07)
#define NBioAPIERROR_VERIFICATION_OPEN_FAIL        (NBioAPIERROR_BASE_GENERAL + 0x08)
#define NBioAPIERROR_DATA_PROCESS_FAIL             (NBioAPIERROR_BASE_GENERAL + 0x09)
#define NBioAPIERROR_MUST_BE_PROCESSED_DATA        (NBioAPIERROR_BASE_GENERAL + 0x0a)
#define NBioAPIERROR_INTERNAL_CHECKSUM_FAIL        (NBioAPIERROR_BASE_GENERAL + 0x0b)
#define NBioAPIERROR_ENCRYPTED_DATA_ERROR          (NBioAPIERROR_BASE_GENERAL + 0x0c)
#define NBioAPIERROR_UNKNOWN_FORMAT                (NBioAPIERROR_BASE_GENERAL + 0x0d)
#define NBioAPIERROR_UNKNOWN_VERSION               (NBioAPIERROR_BASE_GENERAL + 0x0e)
#define NBioAPIERROR_VALIDITY_FAIL                 (NBioAPIERROR_BASE_GENERAL + 0x0f)

#define NBioAPIERROR_INIT_MAXFINGER                (NBioAPIERROR_BASE_GENERAL + 0x10)
#define NBioAPIERROR_INIT_SAMPLESPERFINGER         (NBioAPIERROR_BASE_GENERAL + 0x11)
#define NBioAPIERROR_INIT_ENROLLQUALITY            (NBioAPIERROR_BASE_GENERAL + 0x12)
#define NBioAPIERROR_INIT_VERIFYQUALITY            (NBioAPIERROR_BASE_GENERAL + 0x13)
#define NBioAPIERROR_INIT_IDENTIFYQUALITY          (NBioAPIERROR_BASE_GENERAL + 0x14)
#define NBioAPIERROR_INIT_SECURITYLEVEL            (NBioAPIERROR_BASE_GENERAL + 0x15)

#define NBioAPIERROR_INVALID_MINSIZE               (NBioAPIERROR_BASE_GENERAL + 0x16)
#define NBioAPIERROR_INVALID_TEMPLATE              (NBioAPIERROR_BASE_GENERAL + 0x17)
#define NBioAPIERROR_EXPIRED_VERSION               (NBioAPIERROR_BASE_GENERAL + 0x18)
#define NBioAPIERROR_INVALID_SAMPLESPERFINGER      (NBioAPIERROR_BASE_GENERAL + 0x19)
#define NBioAPIERROR_UNKNOWN_INPUTFORMAT           (NBioAPIERROR_BASE_GENERAL + 0x1a)

#define NBioAPIERROR_INIT_ENROLLSECURITYLEVEL      (NBioAPIERROR_BASE_GENERAL + 0x1b)
#define NBioAPIERROR_INIT_NECESSARYENROLLNUM       (NBioAPIERROR_BASE_GENERAL + 0x1c)
#define NBioAPIERROR_INIT_RESERVED1                (NBioAPIERROR_BASE_GENERAL + 0x1d)
#define NBioAPIERROR_INIT_RESERVED2                (NBioAPIERROR_BASE_GENERAL + 0x1e)
#define NBioAPIERROR_INIT_RESERVED3                (NBioAPIERROR_BASE_GENERAL + 0x1f)
#define NBioAPIERROR_INIT_RESERVED4                (NBioAPIERROR_BASE_GENERAL + 0x20)
#define NBioAPIERROR_INIT_RESERVED5                (NBioAPIERROR_BASE_GENERAL + 0x21)
#define NBioAPIERROR_INIT_RESERVED6                (NBioAPIERROR_BASE_GENERAL + 0x22)
#define NBioAPIERROR_INIT_RESERVED7                (NBioAPIERROR_BASE_GENERAL + 0x23)
#define NBioAPIERROR_OUT_OF_MEMORY                 (NBioAPIERROR_BASE_GENERAL + 0x24)

#define NBioAPIERROR_DEVICE_OPEN_FAIL              (NBioAPIERROR_BASE_DEVICE + 0x01)
#define NBioAPIERROR_INVALID_DEVICE_ID             (NBioAPIERROR_BASE_DEVICE + 0x02)
```

```
#define NBioAPIERROR_WRONG_DEVICE_ID                (NBioAPIERROR_BASE_DEVICE + 0x03)
#define NBioAPIERROR_DEVICE_ALREADY_OPENED          (NBioAPIERROR_BASE_DEVICE + 0x04)
#define NBioAPIERROR_DEVICE_NOT_OPENED              (NBioAPIERROR_BASE_DEVICE + 0x05)
#define NBioAPIERROR_DEVICE_BRIGHTNESS              (NBioAPIERROR_BASE_DEVICE + 0x06)
#define NBioAPIERROR_DEVICE_CONTRAST                (NBioAPIERROR_BASE_DEVICE + 0x07)
#define NBioAPIERROR_DEVICE_GAIN                    (NBioAPIERROR_BASE_DEVICE + 0x08)
#define NBioAPIERROR_LOWVERSION_DRIVER              (NBioAPIERROR_BASE_DEVICE + 0x09)
#define NBioAPIERROR_DEVICE_INIT_FAIL               (NBioAPIERROR_BASE_DEVICE + 0x0a)
#define NBioAPIERROR_DEVICE_LOST_DEVICE             (NBioAPIERROR_BASE_DEVICE + 0x0b)

#define NBioAPIERROR_USER_CANCEL                    (NBioAPIERROR_BASE_UI + 0x01)
#define NBioAPIERROR_USER_BACK                      (NBioAPIERROR_BASE_UI + 0x02)
#define NBioAPIERROR_CAPTURE_TIMEOUT                (NBioAPIERROR_BASE_UI + 0x03)
#define NBioAPIERROR_CAPTURE_FAKE_SUSPICIOUS        (NBioAPIERROR_BASE_UI + 0x04)
#define NBioAPIERROR_ENROLL_EVENT_PLACE             (NBioAPIERROR_BASE_UI + 0x05)
#define NBioAPIERROR_ENROLL_EVENT_HOLD              (NBioAPIERROR_BASE_UI + 0x06)
#define NBioAPIERROR_ENROLL_EVENT_REMOVE            (NBioAPIERROR_BASE_UI + 0x07)
#define NBioAPIERROR_ENROLL_EVENT_PLACE_AGAIN       (NBioAPIERROR_BASE_UI + 0x08)
#define NBioAPIERROR_ENROLL_EVENT_EXTRACT           (NBioAPIERROR_BASE_UI + 0x09)
#define NBioAPIERROR_ENROLL_EVENT_MATCH_FAILED      (NBioAPIERROR_BASE_UI + 0x0a)

// NSEARCH ERROR
#define NBioAPIERROR_INIT_MAXCANDIDATE              (NBioAPIERROR_BASE_NSEARCH + 0x01)
#define NBioAPIERROR_NSEARCH_OPEN_FAIL              (NBioAPIERROR_BASE_NSEARCH + 0x02)
#define NBioAPIERROR_NSEARCH_INIT_FAIL              (NBioAPIERROR_BASE_NSEARCH + 0x03)
#define NBioAPIERROR_NSEARCH_MEM_OVERFLOW           (NBioAPIERROR_BASE_NSEARCH + 0x04)
#define NBioAPIERROR_NSEARCH_SAVE_DB                (NBioAPIERROR_BASE_NSEARCH + 0x05)
#define NBioAPIERROR_NSEARCH_LOAD_DB                (NBioAPIERROR_BASE_NSEARCH + 0x06)
#define NBioAPIERROR_NSEARCH_INVALD_TEMPLATE        (NBioAPIERROR_BASE_NSEARCH + 0x07)
#define NBioAPIERROR_NSEARCH_OVER_LIMIT             (NBioAPIERROR_BASE_NSEARCH + 0x08)
#define NBioAPIERROR_NSEARCH_IDENTIFY_FAIL          (NBioAPIERROR_BASE_NSEARCH + 0x09)
#define NBioAPIERROR_NSEARCH_LICENSE_LOAD           (NBioAPIERROR_BASE_NSEARCH + 0x0a)
#define NBioAPIERROR_NSEARCH_LICENSE_KEY            (NBioAPIERROR_BASE_NSEARCH + 0x0b)
#define NBioAPIERROR_NSEARCH_LICENSE_EXPIRED        (NBioAPIERROR_BASE_NSEARCH + 0x0c)
#define NBioAPIERROR_NSEARCH_DUPLICATED_ID          (NBioAPIERROR_BASE_NSEARCH + 0x0d)
#define NBioAPIERROR_NSEARCH_INVALID_ID             (NBioAPIERROR_BASE_NSEARCH + 0x0e)

#define NBioAPIERROR_IMGCONV_INVALID_PARAM          (NBioAPIERROR_BASE_IMGCONV + 0x01)
#define NBioAPIERROR_IMGCONV_MEMALLOC_FAIL          (NBioAPIERROR_BASE_IMGCONV + 0x02)
#define NBioAPIERROR_IMGCONV_FILEOPEN_FAIL          (NBioAPIERROR_BASE_IMGCONV + 0x03)
#define NBioAPIERROR_IMGCONV_IFILEWRITE_FAIL        (NBioAPIERROR_BASE_IMGCONV + 0x04)

#define NBioAPIERROR_INIT_PRESEARCHRATE             (NBioAPIERROR_BASE_INDEXSEARCH+ 0x01)
#define NBioAPIERROR_INDEXSEARCH_INIT_FAIL          (NBioAPIERROR_BASE_INDEXSEARCH+ 0x02)
#define NBioAPIERROR_INDEXSEARCH_SAVE_DB            (NBioAPIERROR_BASE_INDEXSEARCH+ 0x03)
#define NBioAPIERROR_INDEXSEARCH_LOAD_DB            (NBioAPIERROR_BASE_INDEXSEARCH+ 0x04)
#define NBioAPIERROR_INDEXSEARCH_UNKNOWN_VER        (NBioAPIERROR_BASE_INDEXSEARCH+ 0x05)
#define NBioAPIERROR_INDEXSEARCH_IDENTIFY_FAIL      (NBioAPIERROR_BASE_INDEXSEARCH+ 0x06)
#define NBioAPIERROR_INDEXSEARCH_DUPLICATED_ID      (NBioAPIERROR_BASE_INDEXSEARCH+ 0x07)
#define NBioAPIERROR_INDEXSEARCH_IDENTIFY_STOP      (NBioAPIERROR_BASE_INDEXSEARCH+ 0x08)
```

A.3 Functions

A.3.1 Basic Functions

NBioAPI_Init

NBioAPI_RETURN NBioAPI_Init(NBioAPI_HANDLE_PTR phHandle);

Description

This function initializes the NBioBSP module and returns a handle of the module. It must be called before use of any NBioBSP function.

Parameters

phHandle:

A pointer to a handle that receives the handle of the NBioBSP module.

Return Value

NBioAPIERROR_NONE : No error.

NBioAPIERROR_INVALID_POINTER : Invalid parameter pointer.

NBioAPIERROR_VALIDITY_FAIL: Invalid NBioBSP.dll module

NBioAPIERROR_EXPIRED_VERSION: Expired NBioBSP.dll module

NBioAPI_Terminate

NBioAPI_RETURN NBioAPI_Terminate(NBioAPI_HANDLE hHandle);

Description

This function is to close the NBioBSP module. It cleanup all internal state associated with the calling application. This function must be called once for each call to NBioAPI_Init() function.

Parameters

hHandle:

The handle of the NBioBSP module.

Return Value

NBioAPIERROR_NONE : No error.

NBioAPIERROR_INVALID_HANDLE : Invalid NBioAPI handle.

NBioAPI_GetVersion

NBioAPI_RETURN NBioAPI_GetVersion(NBioAPI_HANDLE hHandle, NBioAPI_VERSION_PTR pVersion);

Description

This function returns the version of the NBioBSP module.

Parameters

hHandle:

The handle of the NBioBSP module.

pVersion:

Pointer to a NBioAPI_VERSION indicating the version.

Return Value

NBioAPIERROR_NONE : No error.

NBioAPIERROR_INVALID_HANDLE : Invalid NBioAPI handle.

NBioAPIERROR_INVALID_POINTER : Invalid parameter pointer.

NBioAPI_GetInitInfo

```
NBioAPI_RETURN NBioAPI_GetInitInfo(
        NBioAPI_HANDLE              hHandle,
        NBioAPI_UINT8               nStructureType, /* must be 0 */
        NBioAPI_INIT_INFO_PTR       pInitInfo);
```

Description

This function is used to receive the initial information of the module.

Parameters

hHandle:

The handle of the NBioBSP module.

nStructureType:

An integer value indicating the type of the NBioAPI_INIT_INFO structure. Must be set to 0 at this version.

pInitInfo:

A pointer to a NBioAPI_INIT_INFO structure that receives the initial information of the module. The structure must be based on the nStructType.

Return Value

NBioAPIERROR_NONE : No error.

NBioAPIERROR_INVALID_HANDLE : Invalid NBioAPI handle.

NBioAPIERROR_INVALID_POINTER : Invalid parameter pointer.

NBioAPIERROR_STRUCTTYPE_NOT_MATCHED : Structure type not matched.

NBioAPIERROR_INVALID_TYPE : Invalid structure type.

NBioAPI_SetInitInfo

```
NBioAPI_RETURN NBioAPI_SetInitInfo(
        NBioAPI_HANDLE              hHandle,
        NBioAPI_UINT8               nStructureType, /* must be 0 */
        NBioAPI_INIT_INFO_PTR       pInitInfo);
```

Description

This function is to configure the initial information of the module. The buffer, pInitInfo, must be initialized before use of this function.

Parameters

hHandle:

The handle of the NBioBSP module.

nStructureType:

An integer value indicating the type of the NBioAPI_INIT_INFO structure. Must be set to 0 at this version.

pInitInfo:

A pointer to a NBioAPI_INIT_INFO structure specifying the initial information of the module. The structure must be based on the nStructType.

Return Value

NBioAPIERROR_NONE : No error.

NBioAPIERROR_INVALID_HANDLE : Invalid NBioAPI handle.

NBioAPIERROR_INVALID_POINTER : Invalid parameter pointer.

NBioAPIERROR_STRUCTTYPE_NOT_MATCHED : Structure type not matched.

NBioAPIERROR_INVALID_TYPE : Invalid structure type.

NBioAPIERROR_INIT_MAXFINGER : Invalid MaxFingersForEnroll.

NBioAPIERROR_INIT_SAMPLESPERFINGER : Invalid SampleNumber.

NBioAPIERROR_INIT_ENROLLQUALITY : Invalid EnrollQuality.
NBioAPIERROR_INIT_VERIFYQUALITY : Invalid VerifyQuality.
NBioAPIERROR_INIT_IDENTIFYQUALITY : Invalid Identify Quality.
NBioAPIERROR_INIT_SECURITYLEVEL : Invalid security level.

NBioAPI_EnumerateDevice

```
NBioAPI_RETURN NBioAPI_EnumerateDevice (
        NBioAPI_HANDLE          hHandle,
        NBioAPI_UINT32*         pNumDevice,
        NBioAPI_DEVICE_ID**     ppDeviceID);
```

Description
This function is to retrieve the number of devices and device IDs attached to the system.

Parameters
hHandle:
The handle of the NBioBSP module.

pNumDevice:
A pointer to a NBioAPI_UINT32 that receives the number of devices.

ppDeviceID:
A pointer to the buffer that receives the device IDs. Allocated and controlled internally in the NBioBSP module, the buffer of device ID list is automatically freed when calling the NBioAPI_Terminate() function.

Return Value
NBioAPIERROR_NONE : No error.
NBioAPIERROR_INVALID_HANDLE : Invalid NBioAPI handle.
NBioAPIERROR_INVALID_POINTER : Invalid parameter pointer.

NBioAPI_EnumerateDeviceEx

```
NBioAPI_RETURN NBioAPI_EnumerateDeviceEx (
        NBioAPI_HANDLE          hHandle,
        NBioAPI_UINT32*         pNumDevice,
        NBioAPI_DEVICE_ID**     ppDeviceID,
NBioAPI_DEVICE_INFO_EX**     ppDeviceInfoEx);
```

Description
This function is to retrieve the more detail information about device include number of devices and device IDs attached to the system.

Parameters
hHandle:
The handle of the NBioBSP module.

pNumDevice:
A pointer to a NBioAPI_UINT32 that receives the number of devices.

ppDeviceID:
A pointer to the buffer that receives the device IDs. Allocated and controlled internally in the NBioBSP module, the buffer of device ID list is automatically freed when calling the NBioAPI_Terminate() function.

ppDeviceInfoEx:
A pointer to the array of structure that receives the device detail information. Allocated and controlled internally in the NBioBSP module, the buffer of structure list is automatically freed when calling the NBioAPI_Terminate() function.

Return Value
NBioAPIERROR_NONE : No error.
NBioAPIERROR_INVALID_HANDLE : Invalid NBioAPI handle.
NBioAPIERROR_INVALID_POINTER : Invalid parameter pointer.

NBioAPI_GetDeviceInfo

```
NBioAPI_RETURN NBioAPI_GetDeviceInfo(
        NBioAPI_HANDLE              hHandle,
        NBioAPI_DEVICE_ID           nDeviceID,
        NBioAPI_UINT8               nStructureType,
        NBioAPI_DEVICE_INFO_PTR     pDeviceInfo);
```

Description

This function retrieves information about the specified device.

Parameters

hHandle:
The handle of the NBioBSP module.

nDeviceID:
The device ID to be queried.

nStructureType:
An integer value indicating the type of the NBioAPI_DEVICE_INFO structure. Must be set to 0 (NBioAPI_DEVICE_INFO_0) at this version.

pDeviceInfo:
A pointer to a NBioAPI_DEVICE_INFO structure that receives the device information.

Return Value

NBioAPIERROR_NONE : No error.
NBioAPIERROR_INVALID_HANDLE : Invalid NBioAPI handle.
NBioAPIERROR_INVALID_POINTER : Invalid parameter pointer.
NBioAPIERROR_DEVICE_NOT_OPENED : Device not opened.
NBioAPIERROR_WRONG_DEVICE_ID : Invalid device ID.
NBioAPIERROR_STRUCTTYPE_NOT_MATCHED : Structure type not matched.
NBioAPIERROR_INVALID_TYPE : Invalid structure type.

NBioAPI_SetDeviceInfo

```
NBioAPI_RETURN NBioAPI_SetDeviceInfo(
        NBioAPI_HANDLE              hHandle,
        NBioAPI_DEVICE_ID           nDeviceID,
        NBioAPI_UINT8               nStructureType,
        NBioAPI_DEVICE_INFO_PTR     pDeviceInfo);
```

Description

This function is to configure the specific options of the device attached to the system. The image width and height in the NBioAPI_DEVICE_INFO structure are read-only.

Parameters

hHandle:
The handle of the NBioBSP module.

nDeviceID:
The device ID to be configured.

nStructureType:
An integer value indicating the type of the NBioAPI_DEVICE_INFO structure. Must be set to 0 (NBioAPI_DEVICE_INFO_0) at this version.
pDeviceInfo:

A pointer to a NBioAPI_DEVICE_INFO structure specifying the device information.

Return Value

NBioAPIERROR_NONE : No error.

NBioAPIERROR_INVALID_HANDLE : Invalid NBioAPI handle.

NBioAPIERROR_INVALID_POINTER : Invalid parameter pointer.

NBioAPIERROR_DEVICE_NOT_OPENED : Device not opened.

NBioAPIERROR_WRONG_DEVICE_ID : Invalid device ID.

NBioAPIERROR_STRUCTTYPE_NOT_MATCHED : Structure type not matched.

NBioAPIERROR_INVALID_TYPE : Invalid structure type.

NBioAPIERROR_DEVICE_BRIGHTNESS : Invalid brightness.

NBioAPIERROR_DEVICE_CONTRAST : Invalid contrast.

NBioAPIERROR_DEVICE_GAIN : Invalid gain.

NBioAPI_OpenDevice

NBioAPI_RETURN NBioAPI_OpenDevice(NBioAPI_HANDLE hHandle, NBioAPI_DEVICE_ID nDeviceID);

Description

This function is to initialize the device. It must be called to use the device related functions such as Capture or Enroll.

Parameters

hHandle:
The handle of the NBioBSP module.

nDeviceID:
The device ID to open. A 0 value means the default device will be used.

Return Value

NBioAPIERROR_NONE : No error.
NBioAPIERROR_INVALID_HANDLE : Invalid NBioAPI handle.
NBioAPIERROR_INVALID_DEVICE_ID : Invalid device ID.
NBioAPIERROR_DEVICE_ALREADY_OPENED : Device already opened.
NBioAPIERROR_DEVICE_OPEN_FAIL : Failed to open the device.
NBioAPIERROR_DEVICE_INIT_FAIL : FDU05 sensor has scale.

NBioAPI_CloseDevice

NBioAPI_RETURN NBioAPI_CloseDevice(NBioAPI_HANDLE hHandle, NBioAPI_DEVICE_ID nDeviceID);

Description

This function is to close the device opened by the OpenDevice function.

Parameters

hHandle:
The handle of the NBioBSP module.

nDeviceID:
The device ID to be closed.

Return Value

NBioAPIERROR_NONE : No error.
NBioAPIERROR_INVALID_HANDLE : Invalid NBioAPI handle.
NBioAPIERROR_DEVICE_NOT_OPENED : Device not opened.
NBioAPIERROR_WRONG_DEVICE_ID : Invalid device ID.

NBioAPI_AdjustDevice

NBioAPI_RETURN NBioAPI_AdjustDevice(NBioAPI_HANDLE hHandle, const NBioAPI_WINDOW_OPTION_PTR pWindowOption);

Description

This function is used to configure the brightness of the device. It prompts a dialog on which users can change the brightness and contrast of the device.

Parameters

hHandle:
The handle of the NBioBSP module.

pWindowOption:
A pointer to a NBioAPI_WINDOW_OPTION structure containing the window options of the NBioBSP module.

Return Value

NBioAPIERROR_NONE : No error.
NBioAPIERROR_INVALID_HANDLE : Invalid NBioAPI handle.
NBioAPIERROR_DEVICE_NOT_OPENED : Device not opened.
NBioAPIERROR_WRONG_DEVICE_ID : Invalid device ID.
NBioAPIERROR_USER_CANCEL : Operation canceled.

NBioAPI_GetOpenedDeviceID

NBioAPI_DEVICE_ID NBioAPI NBioAPI_GetOpenedDeviceID(NBioAPI_HANDLE hHandle);

Description

This function returns the device ID currently opened.

Parameters

hHandle:

The handle of the NBioBSP module.

Return Value

Return device ID.

NBioAPI_CheckFinger

NBioAPI_RETURN NBioAPI_CheckFinger(NBioAPI_HANDLE hHandle, NBioAPI_BOOL* pbExistFinger);

Description

This function is to check if a finger is placed on the fingerprint sensor. Only valid for USB fingerprint devices.

Support: HFDU 01/04/06(device driver version 4.1.0.1 or higher), HFDU 11/14, HFDU 08/09

Not support: HFDU 05/07

Parameters

hHandle:

The handle of the NBioBSP module.

pbExistFinger:

A pointer to BOOL indicating whether a finger is placed on the fingerprint sensor or not. If yes, it returns NBioAPI_TRUE, otherwise NBioAPI_FALSE.

Return Value

NBioAPIERROR_NONE : No error.

NBioAPIERROR_INVALID_HANDLE : Invalid NBioAPI handle.

NBioAPIERROR_DEVICE_NOT_OPENED: Device not opened.

NBioAPIERROR_LOWVERSION_DRIVER: Device driver does not support this feature.

NBioAPI_GetQualityInfo

```
NBioAPI_RETURN NBioAPI NBioAPI_GetQualityInfo (
NBioAPI_HANDLE                  hHandle,
const NBioAPI_INPUT_FIR_PTR     pAuditData,
const NBioAPI_INPUT_FIR_PTR     pFIR,
NBioAPI_UINT8                   nStructureType,
NBioAPI_QUALITY_INFO_PTR        pQualityInfo);
```

Description

This function is to get the quality value of captured fingerprint image. It will be used for quality pre-check for enrollment of high quality fingerprint image.

Parameters

hHandle:

The handle of the NBioBSP module.

pAuditData:

A pointer to AuditData that is received from Capture function.

pFIR:

A pointer to FIR data that is retrieved from Capture function.

nStructureType:

An integer value indicating the type of the NBioAPI_QUALITY_INFO structure. Must be set to 0 (NBioAPI_QUALITY_INFO_0) at this version.

pQualityInfo:

A pointer to a NBioAPI_QUALITY_INFO structure that contains fingerprint image quality value.

Return Value

NBioAPIERROR_NONE : No error.

NBioAPIERROR_INVALID_HANDLE : Invalid NBioAPI handle.

NBioAPIERROR_INVALID_POINTER : Invalid parameter pointer.

NBioAPIERROR_INVALID_TYPE : Invalid structure type.

NBioAPIERROR_UNKNOWN_INPUTFORMAT: Unknown input format.

NBioAPIERROR_UNKNOWN_FORMAT: Unknown format.

NBioAPIERROR_DATA_PROCESS_FAIL: Data process failed.

A.3.2 Memory Functions

NBioAPI_FreeFIRHandle

NBioAPI_RETURN NBioAPI_FreeFIRHandle (NBioAPI_HANDLE hHandle, NBioAPI_FIR_HANDLE hFIR);

Description

This function is to free the memory allocated for the FIR handle. All memory allocated must be freed by this function.

Parameters

hHandle:
The handle of the NBioBSP module.

hFIR:
The handle of the FIR.

Return Value

NBioAPIERROR_NONE : No error.
NBioAPIERROR_INVALID_HANDLE : Invalid NBioAPI handle.

NBioAPI_GetFIRFromHandle

NBioAPI_RETURN NBioAPI_GetFIRFromHandle (NBioAPI_HANDLE hHandle, NBioAPI_FIR_HANDLE hFIR, NBioAPI_FIR_PTR pFIR);

Description

This function is to receive a FIR from the FIR handle. An application must allocate the buffer for the NBioAPI_FIR structure. Note that this function have the same result as NBioAPI_GetExtendedFromHandle( ) function.

Parameters

hHandle:
The handle of the NBioBSP module.

hFIR:
The handle of the FIR.

pFIR:
A pointer to a NBioAPI_FIR that receives the FIR.

Return Value

NBioAPIERROR_NONE : No error.
NBioAPIERROR_INVALID_HANDLE : Invalid NBioAPI handle.
NBioAPIERROR_INVALID_POINTER : Invalid parameter pointer.
NBioAPIERROR_UNKNOWN_FORMAT: Unkown format.

NBioAPI_GetHeaderFromHandle

```
NBioAPI_RETURN NBioAPI_GetHeaderFromHandle (
            NBioAPI_HANDLE              hHandle,
            NBioAPI_FIR_HANDLE          hFIR,
            NBioAPI_FIR_HEADER_PTR      pHeader);
```

Description

This function is to retrieve the FIR header information from the FIR handle. An application must allocate the buffer for the NBioAPI_FIR structure. Note that this function have the same result as NBioAPI_GetExtendedFromHandle() function.

Parameters

hHandle:
The handle of the NBioBSP module.

hFIR:
The handle of the FIR.

pHeader:
A pointer to a NBioAPI_FIR_HEADER structure that receives the FIR header.

Return Value

NBioAPIERROR_NONE : No error.
NBioAPIERROR_INVALID_HANDLE : Invalid NBioAPI handle.
NBioAPIERROR_INVALID_POINTER : Invalid parameter pointer.
NBioAPIERROR_UNKNOWN_FORMAT: Unkown format.

NBioAPI_GetExtendedFIRFromHandle

```
NBioAPI_RETURN NBioAPI_GetExtendedFIRFromHandle (
            NBioAPI_HANDLE              hHandle,
            NBioAPI_FIR_HANDLE          hFIR,
            NBioAPI_VOID_PTR            pFIR,
            NBioAPI_FIR_FORMAT          Format);
```

Description

This function is to retrieve a FIR data from the FIR handle. An application must allocate the buffer for the NBioAPI_FIR structure.

Parameters

hHandle:
The handle of the NBioBSP module.

hFIR:
The handle of the FIR.

pFIR:
A pointer to a NBioAPI_VOID that receive the FIR.

Format:
The format of the FIR. Only NBioAPI_FIR_FORMAT_STANDARD is used.

Return Value

NBioAPIERROR_NONE : No error.
NBioAPIERROR_INVALID_HANDLE : Invalid NBioAPI handle.
NBioAPIERROR_INVALID_POINTER : Invalid parameter pointer.
NBioAPIERROR_UNKNOWN_FORMAT: Unkown format.

NBioAPI_GetExtendedHeaderFromHandle

```
NBioAPI_RETURN NBioAPI_GetExtendedHeaderFromHandle (
            NBioAPI_HANDLE              hHandle,
            NBioAPI_FIR_HANDLE          hFIR,
            NBioAPI_VOID_PTR            pHeader,
            NBioAPI_FIR_FORMAT          Format);
```

Description

This function is to retrieve the FIR header from the FIR handle. An application must allocate the buffer for the NBioAPI_FIR structure.

Parameters

hHandle:
The handle of the NBioBSP module.

hFIR:
The handle of the FIR.

pHeader:
A pointer to a NBioAPI_VOID that receives the FIR header.

Format:
The format of the FIR. Only NBioAPI_FIR_FORMAT_STANDARD is used.

Return Value

NBioAPIERROR_NONE : No error.

NBioAPIERROR_INVALID_HANDLE : Invalid NBioAPI handle.

NBioAPIERROR_INVALID_POINTER : Invalid parameter pointer.

NBioAPIERROR_UNKNOWN_FORMAT: Unkown format.

NBioAPI_FreeFIR

NBioAPI_RETURN NBioAPI_FreeFIR (NBioAPI_HANDLE hHandle, NBioAPI_VOID_PTR pFIR);

Description

This function is to free the memory allocated for a FIR. It must be called once for each call to GetFIRFromHandle() function.

Parameters

hHandle:

The handle of the NBioBSP module.

pFIR:

A pointer to the FIR.

Return Value

NBioAPIERROR_NONE : No error.

NBioAPIERROR_INVALID_HANDLE : Invalid NBioAPI handle.

NBioAPIERROR_UNKNOWN_FORMAT: Unkown format.

NBioAPI_FreePayload

NBioAPI_RETURN NBioAPI_FreePayload (NBioAPI_HANDLE hHandle, NBioAPI_FIR_PAYLOAD_PTR pPayload);

Description

This function is to free the memory allocated for a payload.

Parameters

hHandle:

The handle of the NBioBSP module.

pPayload:

A pointer to the payload.

Return Value

NBioAPIERROR_NONE : No error.

NBioAPI_GetTextFIRFromHandle

```
NBioAPI_RETURN NBioAPI_GetTextFIRFromHandle (
            NBioAPI_HANDLE                      hHandle,
            NBioAPI_FIR_HANDLE                  hFIR,
            NBioAPI_FIR_TEXTENCODE_PTR          pTextFIR,
            NBioAPI_BOOL                        bIsWide);
```

Description

This function is to retrieve the text-encoded FIR from the FIR handle. An application must allocate the buffer for the NBioAPI_FIR_TEXTENCODE structure. Note that this function have the same result as NBioAPI_GetExtendedTextFIRFromHandle() function.

Parameters

hHandle:
The handle of the NBioBSP module.

hFIR:
The handle of the FIR.

pTextFIR:
A pointer to a NBioAPI_FIR_TEXTENCODE structure that receives the text encoded FIR.

bIsWide:
Flag whether an application uses Unicode characters or not.

Return Value

NBioAPIERROR_NONE : No error.
NBioAPIERROR_INVALID_HANDLE : Invalid NBioAPI handle.
NBioAPIERROR_INVALID_POINTER : Invalid parameter pointer.
NBioAPIERROR_UNKNOWN_FORMAT: Unkown format.

NBioAPI_GetExtendedTextFIRFromHandle

```
NBioAPI_RETURN NBioAPI_GetExtendedTextFIRFromHandle (
            NBioAPI_HANDLE                      hHandle,
            NBioAPI_FIR_HANDLE                  hFIR,
            NBioAPI_FIR_TEXTENCODE_PTR          pTextFIR,
            NBioAPI_BOOL                        bIsWide,
            NBioAPI_FIR_FORMAT                  Format);
```

Description

This function is to receive the text-encoded FIR from the FIR handle. An application must allocate the buffer for the NBioAPI_FIR_TEXTENCODE structure.

Parameters

hHandle:
The handle of the NBioBSP module.

hFIR:
The handle of the FIR.

pTextFIR:
A pointer to a NBioAPI_FIR_TEXTENCODE structure that receives the text encoded FIR.

bIsWide:
Flag whether an application uses Unicode characters or not.

Format:
The format of the FIR. Only NBioAPI_FIR_FORMAT_STANDARD is used.

Return Value
NBioAPIERROR_NONE : No error.
NBioAPIERROR_INVALID_HANDLE : Invalid NBioAPI handle.
NBioAPIERROR_INVALID_POINTER : Invalid parameter pointer.
NBioAPIERROR_UNKNOWN_FORMAT: Unkown format.

NBioAPI_FreeTextFIR

```
NBioAPI_RETURN NBioAPI_FreeTextFIR (
        NBioAPI_HANDLE                  hHandle,
        NBioAPI_FIR_TEXTENCODE_PTR      pTextFIR);
```

Description
This function is to free the memory allocated for the text-encoded FIR. It must be called once for each call to the GetTextFIRFromHandle() function.

Parameters
hHandle:
The handle of the NBioBSP module.

pTextFIR:
A pointer to the text encoded FIR.

Return Value
NBioAPIERROR_NONE : No error.

A.3.3 BSP Functions

NBioAPI_Capture

```
NBioAPI_RETURN NBioAPI_Capture(
        NBioAPI_HANDLE                      hHandle,
        NBioAPI_FIR_PURPOSE                 nPurpose,
        NBioAPI_FIR_HANDLE_PTR              phCapturedFIR,
        NBioAPI_SINT32                      nTimeout,
        NBioAPI_FIR_HANDLE_PTR              phAuditData,
        const NBioAPI_WINDOW_OPTION_PTR     pWindowOption);
```

Descriptions

This function captures samples for the purpose specified, and returns either an "intermediate" type FIR or a "processed" FIR. The purpose is recorded in the header of the CapturedFIR. If AuditData is non-NULL, a FIR of type "raw" may be returned. The function returns handles to whatever data is collected, and all local operations can be completed through use for the handles.

Parameters

hHandle: The handle of the NBioBSP module.

nPurpose:

A value indicating the purpose of the fingerprint data capture. The different NBioBSP dialogs are displayed depending on the purpose.

- NBioAPI_FIR_PURPOSE_VERIFY : For the purpose of verification.
- NBioAPI_FIR_PURPOSE_IDENTIFY : For the purpose of identification.
- NBioAPI_FIR_PURPOSE_ENROLL: For the purpose of enrollment.
- NBioAPI_FIR_PURPOSE_AUDIT: For the purpose of image acquisition.

phCapturedFIR:

A handle to a FIR containing captured data. This data is either an "intermediate" type FIR (which can only be used by either the Process or CreateTemplate functions, depending on the purpose), or a "processed" FIR, (which can be used directly by VerifyMatch, depending on the purpose).

Note : The NBioBSP module creates the "Processed" fingerprint data when using the Capture method.

nTimeout:

An integer specifying the timeout value (in milliseconds) for the operation. If this timeout reached, the function returns an error, and no results. This value can be any positive number. A –1 value means the NBioBSP's default timeout value will be used.

phAuditData:

A handle to a FIR containing raw fingerprint data. This data may be used to provide human-identifiable data of the person at the device. If the pointer is NULL on input, no audit data is collected.

pWindowOption:

A pointer to a NBioAPI_WINDOW_OPTION structure containing the window options of the NBioBSP module.

Return Value

NBioAPIERROR_NONE : No Error.

NBioAPIERROR_INVALID_HANDLE : Invalid NBioAPI handle.

NBioAPIERROR_DEVICE_NOT_OPENED : Device not opened.

NBioAPIERROR_USER_CANCEL : Operation canceled.

NBioAPIERROR_DEVICE_LOST_DEVICE: Device disconnected.

NBioAPIERROR_CAPTURE_TIMEOUT: Time out.

NBioAPIERROR_CAPTURE_FAKE_SUSPICIOUS: Same NBioAPIERROR_CAPTURE_TIMEOUT

NBioAPIERROR_DATA_PROCESS_FAIL: Template data process failed.

NBioAPI_ RollCapture

```
NBioAPI_RETURN NBioAPI_RollCapture (
NBioAPI_HANDLE                    hHandle,
NBioAPI_FIR_PURPOSE               nPurpose,
NBioAPI_SINT32                    nTimeout,
NBioAPI_FIR_HANDLE_PTR            phCapturedFIR,
NBioAPI_FIR_HANDLE_PTR            phAuditData
const NBioAPI_WINDOW_OPTION_PTR pWindowOption);
```

Descriptions

This function captures samples for the purpose specified without preview status.

Parameters

hHandle:

The handle of the NBioBSP module.

nPurpose:

A value indicating the purpose of the fingerprint data capture. The different NBioBSP dialogs are displayed depending on the purpose.

- NBioAPI_FIR_PURPOSE_VERIFY : For the purpose of verification.
- NBioAPI_FIR_PURPOSE_IDENTIFY : For the purpose of identification.
- NBioAPI_FIR_PURPOSE_ENROLL: For the purpose of enrollment.
- NBioAPI_FIR_PURPOSE_AUDIT: For the purpose of image acquisition.

nTimeout:

An integer specifying the timeout value (in milliseconds) for the operation. If this timeout reached, the function returns an error, and no results. This value can be any positive number. A –1 value means the NBioBSP’s default timeout value will be used.

phCapturedFIR:

A handle to a FIR containing captured data. This data is either an “intermediate” type FIR (which can only be used by either the Process or CreateTemplate functions, depending on the purpose), or a “processed” FIR, (which can be used directly by VerifyMatch, depending on the purpose).

Note : The NBioBSP module creates the “Processed” fingerprint data when using the Capture method.

phAuditData:

A handle to a FIR containing raw fingerprint data. This data may be used to provide human-identifiable data of the person at the device. If the pointer is NULL on input, no audit data is collected.

pWindowOption:

A pointer to a NBioAPI_WINDOW_OPTION structure containing the window options of the NBioBSP module.

Return Value

NBioAPIERROR_NONE : No Error.

NBioAPIERROR_INVALID_HANDLE : Invalid NBioAPI handle.

NBioAPIERROR_DEVICE_NOT_OPENED : Device not opened.

NBioAPIERROR_USER_CANCEL : Operation canceled.

NBioAPIERROR_ALREADY_RUN_ROLLCAPTURE : Already run Roll Capture.

NBioAPIERROR_CAPTURE_TIMEOUT: Time out.

NBioAPIERROR_CAPTURE_FAKE_SUSPICIOUS: Same NBioAPIERROR_CAPTURE_TIMEOUT

NBioAPIERROR_DATA_PROCESS_FAIL: Template data process failed.

NBioAPI_Process

```
NBioAPI_RETURN NBioAPI_Process(
        NBioAPI_HANDLE                    hHandle,
        const NBioAPI_INPUT_FIR_PTR       piCapturedFIR,
        NBioAPI_FIR_HANDLE_PTR            phProcessedFIR);
```

Descriptions

This function processes the intermediate data captured via a call to NBioBSP_Capture for the purpose of either verification or identification. If the processing capability is in the NBioBSP, the NBioBSP builds a “processed” FIR, otherwise, ProcessedFIR is set to NULL.

Parameters

hHandle:
The handle of the NBioBSP module.

piCapturedFIR:
The captured FIR of its handle.

phProcessedFIR:
A handle for the newly constructed “processed” FIR.

Return Value

NBioAPIERROR_NONE : No error.
NBioAPIERROR_INVALID_HANDLE : Invalid NBioAPI handle.
NBioAPIERROR_INVALID_POINTER : Invalid parameter pointer.
NBioAPIERROR_ALREADY_PROCESSED : FIR already processed.
NBioAPIERROR_DATA_PROCESS_FAIL : Data cannot be processed.
NBioAPIERROR_UNKNOWN_INPUTFORMAT: Unknown input format.
NBioAPIERROR_UNKNOWN_FORMAT: Unknown format.
NBioAPIERROR_ENCRYPTED_DATA_ERROR : Data cannot be decrypted.
NBioAPIERROR_INTERNAL_CHECKSUM_FAIL : Data forged.

NBioAPI_CreateTemplate

```
NBioAPI_RETURN NBioAPI_CreateTemplate(
        NBioAPI_HANDLE                      hHandle,
        const NBioAPI_INPUT_FIR_PTR         piCapturedFIR,
        const NBioAPI_INPUT_FIR_PTR         piStoredTemplate,
        NBioAPI_FIR_HANDLE_PTR              phNewTemplate.
        const NBioAPI_FIR_PAYLOAD_PTR       pPayload);
```

Descriptions

This function takes a FIR containing raw fingerprint data for the purpose of creating a new enrollment template. A new FIR is constructed from the CapturedFIR, and (optionally) it may perform an adaptation based on an existing StoredTemplate. The old StoredTemplate remains unchanged. If the StoredTemplate contains a payload, the payload is not copied into the NewTemplate. If the NewTemplate needs a payload, then that Payload must be presented as an argument to the function.

Parameters

hHandle:
The handle of the NBioBSP module.

piCapturedFIR:
Pointer to the captured FIR. The CapturedFIR acquired for the purpose of “verification” can be used for this parameter.

piStoredTemplate:
Optionally, the template to be adapted.

phNewTemplate:
A handle to a newly created template that is derived from the CapturedFIR and (optionally) the StoredTemplate.

pPayload:
A pointer to data that will be wrapped inside the newly created template. If NULL, this parameter is ignored.

Return Value

NBioAPIERROR_NONE : No error.
NBioAPIERROR_INVALID_HANDLE : Invalid NBioAPI handle.
NBioAPIERROR_INVALID_POINTER : Invalid parameter pointer.
NBioAPIERROR_DATA_PROCESS_FAIL : Data cannot be processed.
NBioAPIERROR_MUST_BE_PROCESSED_DATA : Not “Processed” data.
NBioAPIERROR_UNKNOWN_INPUTFORMAT: Unknown input format.
NBioAPIERROR_UNKNOWN_FORMAT: Unknown format.
NBioAPIERROR_ENCRYPTED_DATA_ERROR : Data cannot be decrypted.
NBioAPIERROR_INTERNAL_CHECKSUM_FAIL : Data forged.

NBioAPI_VerifyMatch

```
NBioAPI_RETURN NBioAPI_VerifyMatch(
        NBioAPI_HANDLE                  hHandle,
        const NBioAPI_INPUT_FIR_PTR     piProcessedFIR,
        const NBioAPI_INPUT_FIR_PTR     piStoredTemplate,
        NBioAPI_BOOL*                   pbResult,
        NBioAPI_FIR_PAYLOAD_PTR         pPayLoad);
```

Descriptions

This function performs a verification (1-to-1) match between FIRs; the ProcessedFIR and the StoredTemplate. The ProcessedFIR is the "processed" FIR constructed specifically for the verification. The StoredTemplate was created at enrollment. If the StoredTemplate contains a Payload, the Payload may be returned upon successful verification.

Parameters

hHandle:
The handle of the NBioBSP module.

piProcessedFIR:
The FIR to be verified, or its handle.

piStoredTemplate:
The FIR to be verified against.

pbResult:
A pointer to a Boolean value indicating (TRUE/FALSE) whether the FIRs matched or not.

pPayload:
If the StoredTemplate contains a payload, it is returned in an allocated NBioAPI_FIR_PAYLOAD structure.

Return Value

NBioAPIERROR_NONE : No error.
NBioAPIERROR_INVALID_HANDLE : Invalid NBioAPI handle.
NBioAPIERROR_INVALID_POINTER : Invalid parameter pointer.
NBioAPIERROR_DATA_PROCESS_FAIL : Data cannot be processed.
NBioAPIERROR_MUST_BE_PROCESSED_DATA : Not "Processed" data.
NBioAPIERROR_UNKNOWN_INPUTFORMAT: Unknown input format.
NBioAPIERROR_UNKNOWN_FORMAT: Unknown format.
NBioAPIERROR_ENCRYPTED_DATA_ERROR : Data cannot be decrypted.
NBioAPIERROR_INTERNAL_CHECKSUM_FAIL : Data forged.

NBioAPI_VerifyMatchEx

```
NBioAPI_RETURN NBioAPI_VerifyMatchEx(
        NBioAPI_HANDLE                      hHandle,
        const NBioAPI_INPUT_FIR_PTR         piProcessedFIR,
        const NBioAPI_INPUT_FIR_PTR         piStoredTemplate,
        NBioAPI_BOOL*                       pbResult,
        NBioAPI_FIR_PAYLOAD_PTR             pPayLoad,
        NBioAPI_MATCH_OPTION_PTR            pMatchOption);
```

Descriptions

This function performs a verification (1-to-1) match between FIRs; the ProcessedFIR and the StoredTemplate. The ProcessedFIR is the "processed" FIR constructed specifically for the verification. The StoredTemplate was created at enrollment. If the StoredTemplate contains a Payload, the Payload may be returned upon successful verification. Only difference with the NBioAPI_VerifyMatch function is that it takes a set of matching condition as a parameter

Parameters

hHandle:
The handle of the NBioBSP module.

piProcessedFIR:
The FIR to be verified, or its handle.

piStoredTemplate:
The FIR to be verified against.

pbResult:
A pointer to a Boolean value indicating (TRUE/FALSE) whether the FIRs matched or not.

pPayload:
If the StoredTemplate contains a payload, it is returned in an allocated NBioAPI_FIR_PAYLOAD structure.

PMatchOption:
A set of condition for matching operation.

Return Value

NBioAPIERROR_NONE : No error.
NBioAPIERROR_INVALID_HANDLE : Invalid NBioAPI handle.
NBioAPIERROR_INVALID_POINTER : Invalid parameter pointer.
NBioAPIERROR_DATA_PROCESS_FAIL : Data cannot be processed.
NBioAPIERROR_MUST_BE_PROCESSED_DATA : Not "Processed" data.
NBioAPIERROR_UNKNOWN_INPUTFORMAT: Unknown input format.
NBioAPIERROR_UNKNOWN_FORMAT: Unknown format.
NBioAPIERROR_ENCRYPTED_DATA_ERROR : Data cannot be decrypted.
NBioAPIERROR_INTERNAL_CHECKSUM_FAIL : Data forged.

NBioAPI_Enroll

```
NBioAPI_RETURN NBioAPI_Enroll(
        NBioAPI_HANDLE                      hHandle,
        const NBioAPI_INPUT_FIR_PTR         piStoredTemplate,
        NBioAPI_FIR_HANDLE_PTR              phNewTemplate,
        const NBioAPI_FIR_PAYLOAD_PTR       pPayload,
        NBioAPI_SINT32                      nTimeout,
        NBioAPI_FIR_HANDLE_PTR              phAuditData,
        const NBioAPI_WINDOW_OPTION_PTR     pWindowOption);
```

Descriptions

This function captures fingerprint data from the attached device to create a ProcessedFIR for the purpose of enrollment.

Parameters

hHandle:

The handle of the NBioBSP module.

piStoredTemplate:

Optionally, the FIR to be adapted.

phNewTemplate:

A handle to a newly created template that is derived from the new raw samples and (optionally) the StoredTemplate.

pPayload:

A pointer to data that will be wrapped inside the newly created template. If NULL, this parameter is ignored.

nTimeout:

An integer specifying the timeout value (in milliseconds) for the operation. If this timeout is reached, the function returns an error, and no results. This value can be any positive number. A –1 value means the FIR's default timeout value will be used.

phAuditData:

A handle to a FIR containing fingerprint audit data. This data may be used to provide a human-identifiable data of the person at the device. If the pointer is NULL on input, no audit data is collected.

pWindowOption:

A pointer to a NBioAPI_WINDOW_OPTION structure containing the window options of the NBioBSP module.

Return Value

NBioAPIERROR_NONE : No error.

NBioAPIERROR_INVALID_HANDLE : Invalid NBioAPI handle.

NBioAPIERROR_INVALID_POINTER : Invalid parameter pointer.

NBioAPIERROR_DATA_PROCESS_FAIL : Data cannot be processed.

NBioAPIERROR_UNKNOWN_INPUTFORMAT: Unknown input format.

NBioAPIERROR_UNKNOWN_FORMAT: Unknown format.

NBioAPIERROR_ENCRYPTED_DATA_ERROR : Data cannot be decrypted.

NBioAPIERROR_INTERNAL_CHECKSUM_FAIL : Data forged.

NBioAPIERROR_DEVICE_NOT_OPENED : Device not opened.

NBioAPIERROR_USER_CANCEL : Operation canceled.

NBioAPIERROR_FUNCTION_FAIL : Function failed

NBioAPI_Verify

```
NBioAPI_RETURN NBioAPI_Verify (
          NBioAPI_ HANDLE                        hHandle,
          const NBioAPI_INPUT_FIR_PTR            piStoredTemplate,
          NBioAPI_BOOL*                          pbResult,
          NBioAPI_FIR_PAYLOAD_PTR                pPayload,
          NBioAPI_SINT32                         nTimeout,
          NBioAPI_FIR_HANDLE_PTR                 phAuditData,
          const NBioAPI_WINDOW_OPTION_PTR        pWindowOption);
```

Descriptions

This function captures fingerprint data from the attached device, and compares it against the StoredTemplate.

Parameters

hHandle:
The handle of the NBioBSP module.

piStoredTemplate:
The FIR to be verified against.

pbResult :
A pointer to a Boolean value indicating (TRUE/FALSE) whether the FIRs matched or not.

pPayload:
If the StoredTemplate contains a payload, it is returned in an allocated NBioAPI_FIR_PAYLOAD structure.

nTimeout:
An integer specifying the timeout value (in milliseconds) for the operation. If the timeout is reached, the function returns an error, and no results. This value can be any positive number. A –1 value means the FIR's default timeout value will be used.

phAuditData:
A handle to a FIR containing raw fingerprint data. This data may be used to provide human-identifiable data of the person at the device. If the pointer is NULL on input, no audit data is collected.

pWindowOption:
A pointer to a NBioAPI_WINDOW_OPTION structure containing the window options of the NBioBSP module.

Return Value

NBioAPIERROR_NONE : No error.
NBioAPIERROR_INVALID_HANDLE : Invalid NBioAPI handle.
NBioAPIERROR_INVALID_POINTER : Invalid parameter pointer.
NBioAPIERROR_DATA_PROCESS_FAIL : Data cannot be processed.
NBioAPIERROR_UNKNOWN_INPUTFORMAT: Unknown input format.
NBioAPIERROR_UNKNOWN_FORMAT: Unknown format.
NBioAPIERROR_ENCRYPTED_DATA_ERROR : Data cannot be decrypted.
NBioAPIERROR_INTERNAL_CHECKSUM_FAIL : Data forged.
NBioAPIERROR_DEVICE_NOT_OPENED : Device not opened.
NBioAPIERROR_USER_CANCEL : Operation canceled.
NBioAPIERROR_FUNCTION_FAIL : Function failed

A.3.4 Conversion Functions

NBioAPI_FDxToNBioBSP

```
NBioAPI_RETURN NBioAPI_FDxToNBioBSP(
          NBioAPI_HANDLE              hHandle,
          NBioAPI_UINT8*              pFDxData,
          NBioAPI_UINT32              nFDxDataSize,
          NBioAPI_UINT32              nFDxDataType,
          NBioAPI_FIR_PURPOSE         Purpose,
          NBioAPI_FIR_HANDLE_PTR      phProcessedFIR);
```

Descriptions

This function is to convert the FDx data (400-byte minutiae array) to the FIR format in a handle of FIR. This function does not accept raw data.

Parameters

hHandle:
The handle of the NBioBSP module.

pFDxData:
The FDxData to be converted.

nFDxDataSize:
Size, in bytes, of the FDxData. This value must be a multiple of 400 which is the size of a single minutiae data. Ex.) 400, 800, 1200, …

nFDxDataType :
The type of the FDxData.

Purpose:
A value indicating the desired purpose of the ProcessedFIR.
NBioAPI_FIR_PURPOSE_VERIFY: Data captured for verification.
NBioAPI_FIR_PURPOSE_IDENTIFY: Data captured for identification.
NBioAPI_FIR_PURPOSE_ENROLL: Data captured for enrollment.

phProcessedFIR:
A pointer to the ProcessedFIR handle.

Return Value

NBioAPIERROR_NONE : No error.
NBioAPIERROR_INVALID_HANDLE : Invalid NBioAPI handle.
NBioAPIERROR_INVALID_POINTER : Invalid parameter pointer.
NBioAPIERROR_INVALID_MINSIZE : Invalid minutiae size.
NBioAPIERROR_FUNCTION_FAIL : Function failed.

NBioAPI_FDxToNBioBSPEx

```
NBioAPI_RETURN NBioAPI_FDxToNBioBSPEx(
          NBioAPI_HANDLE               hHandle,
          NBioAPI_UINT8*               pFDxData,
          NBioAPI_UINT32               nFDxDataSize,
          NBioAPI_UINT32               nFDxTemplateSize,
          NBioAPI_UINT32               nFDxDataType,
          NBioAPI_FIR_PURPOSE          Purpose,
          NBioAPI_FIR_HANDLE_PTR       phProcessedFIR);
```

Descriptions

This function is to convert the FDx data to the FIR format in a handle of FIR. This function does not accept raw data.

Parameters

hHandle:
The handle of the NBioBSP module.

pFDxData:
The FDxData to be converted.

nFDxDataSize:
Size, in bytes, of the FDxData. This value must be a multiple of nFDxTemplateSize which is the size of a single minutiae data.

nFDxTemplateSize:
The size of a single minutiae data.

nFDxDataType :
The type of the FDxData.

Purpose:
A value indicating the desired purpose of the ProcessedFIR.
NBioAPI_FIR_PURPOSE_VERIFY: Data captured for verification.
NBioAPI_FIR_PURPOSE_IDENTIFY: Data captured for identification.
NBioAPI_FIR_PURPOSE_ENROLL: Data captured for enrollment.

phProcessedFIR:
A pointer to the ProcessedFIR handle.

Return Value

NBioAPIERROR_NONE : No error.
NBioAPIERROR_INVALID_HANDLE : Invalid NBioAPI handle.
NBioAPIERROR_INVALID_POINTER : Invalid parameter pointer.
NBioAPIERROR_INVALID_MINSIZE : Invalid minutiae size.
NBioAPIERROR_FUNCTION_FAIL : Function failed.

NBioAPI_NBioBSPToFDx

```
NBioAPI_RETURN NBioAPI_NBioBSPToFDx(
        NBioAPI_HANDLE                  hHandle,
        const NBioAPI_INPUT_FIR_PTR     piFIR,
        NBioAPI_EXPORT_DATA_PTR         pExportData,
        MINCONV_DATA_TYPE               nExportType);
```

Descriptions

This function is to convert the FIR data to FDx data format (400-byte minutiae array) in a pointer to the NBioAPI_EXPORT_DATA structure.

Parameters

hHandle:

The handle of the NBioBSP module.

piFIR:

The FIR data to be converted.

pExportData:

A pointer to a NBioAPI_EXPORT_DATA structure that receives the data converted from the FIR input.

FDxDataType :

A value indicating the type of exportation.

Return Value

NBioAPIERROR_NONE : No error.

NBioAPIERROR_INVALID_HANDLE : Invalid NBioAPI handle.

NBioAPIERROR_INVALID_POINTER : Invalid parameter pointer.

NBioAPIERROR_MUST_BE_PROCESSED_DATA : Not “Processed” data.

NBioAPIERROR_UNKNOWN_FORMAT: Unknown format.

NBioAPIERROR_ENCRYPTED_DATA_ERROR : Data cannot be decrypted.

NBioAPIERROR_INTERNAL_CHECKSUM_FAIL : Data forged.

NBioAPI_FreeExportData

```
NBioAPI_RETURN NBioAPI_FreeExportData (
        NBioAPI_ HANDLE             hHandle,
        NBioAPI_EXPORT_DATA_PTR     pExportData);
```

Descriptions

This function is to free the memory allocated for data conversion. It must be called once for each call to the NBioAPI_NBioBSPToFDx() function.

Parameters

hHandle:

The handle of the NBioBSP module.

pExportData:

A pointer to the NBioAPI_EXPORT_DATE structure to be freed.

Return Value

NBioAPIERROR_NONE : No error.

NBioAPI_NBioBSPToImage

```
NBioAPI_RETURN NBioAPI_NBioBSPToImage(
        NBioAPI_ HANDLE                      hHandle,
        const NBioAPI_INPUT_FIR_PTR          piAuditFIR,
        NBioAPI_EXPORT_AUDIT_DATA_PTR        pExportAuditData);
```

Descriptions

This function is to convert the FIR data to an image data in a pointer to the NBioAPI_EXPORT_AUDIT_DATA structure.

Parameters

hHandle:

The handle of the NBioBSP module.

piAuditFIR:

A pointer to a NBioAPI_INPUT_FIR structure specifying the FIR to be converted to image data.

pExportAuditData:

: A pointer to a NBioAPI_EXORT_DATA structure that receives the image data converted from the FIR. This structure contains information about the FIR and the FDx data.

Return Value

NBioAPIERROR_NONE : No error.

NBioAPIERROR_INVALID_HANDLE : Invalid NBioAPI handle.

NBioAPIERROR_INVALID_POINTER : Invalid parameter pointer.

NBioAPIERROR_ALREADY_PROCESSED : Data already processed.

NBioAPI_ImageToNBioBSP

```
NBioAPI_RETURN NBioAPI_ImageToNBioBSP (
        NBioAPI_ HANDLE                      hHandle,
        NBioAPI_EXPORT_AUDIT_DATA_PTR        pExportAuditData,
        NBioAPI_FIR_HANDLE_PTR               phAuditFIR);
```

Descriptions

This function is to convert raw image data into a FIR format.

Parameters

hHandle:

The handle of the NBioBSP module.

pExportAuditData:

A pointer to a NBioAPI_EXPORT_DATA structure to be converted.

phAuditFIR:

A pointer to a NBioAPI_FIR_HANDLE that receives the FIR handle.

Return Value

NBioAPIERROR_NONE : No error.

NBioAPIERROR_INVALID_HANDLE : Invalid NBioAPI handle.

NBioAPIERROR_INVALID_POINTER : Invalid parameter pointer.

NBioAPI_FreeExportAuditData

```
NBioAPI_RETURN NBioAPI_FreeExportAuditData(
        NBioAPI_ HANDLE hHandle,
        NBioAPI_EXPORT_AUDIT_DATA_PTR pExportAuditData);
```

Descriptions

This function is to free the memory allocated for the audit data. It must be called once for each call to the NBioAPI_NBioBSPToImage() function.

Parameters

hHandle:
The handle of the NBioBSP module.

pExportAuditData:
A pointer to a NBioAPI_EXPORT_AUDIT_DATA structure to be freed.

Return Value

NBioAPIERROR_NONE : No error.
NBioAPIERROR_INVALID_HANDLE : Invalid NBioAPI handle.
NBioAPIERROR_INVALID_POINTER : Invalid parameter pointer.

NBioAPI_ImportDataToNBioBSP

```
NBioAPI_RETURN NBioAPI NBioAPI_ImportDataToNBioBSP(
        NBioAPI_HANDLE                  hHandle,
        NBioAPI_EXPORT_DATA_PTR         pExportData,
        NBioAPI_FIR_PURPOSE             Purpose,
        NBioAPI_FIR_HANDLE_PTR          phProcessedFIR);
```

Descriptions

This function is to convert minutiae data into a FIR format.

Parameters

hHandle:

The handle of the NBioBSP module.

pExportData:

A pointer to a NBioAPI_EXPORT_DATA structure to be converted.

Purpose:

A value indicating the purpose of conversion.

phProcessedFIR:

A pointer to a NBioAPI_FIR_HANDLE that receives the FIR handle.

Return Value

NBioAPIERROR_NONE : No error.

NBioAPIERROR_INVALID_HANDLE : Invalid NBioAPI handle.

NBioAPIERROR_INVALID_POINTER : Invalid parameter pointer.

NBioAPIERROR_INVALID_MINSIZE : Invalid minutiae size.

NBioAPI_ImportDataToNBioBSPEx

```
NBioAPI_RETURN NBioAPI NBioAPI_ImportDataToNBioBSPEx(
        NBioAPI_HANDLE                  hHandle,
        NBioAPI_EXPORT_DATA_PTR         pExportData,
        NBioAPI_FIR_PURPOSE             Purpose,
        NBioAPI_FIR_DATA_TYPE           DataType,
        NBioAPI_FIR_HANDLE_PTR          phProcessedFIR);
```

Descriptions

This function is to convert minutiae data into a FIR format.

Parameters

hHandle:

The handle of the NBioBSP module.

pExportData:

A pointer to a NBioAPI_EXPORT_DATA structure to be converted.

Purpose:

A value indicating the purpose of conversion.

DataType:

A value indication the data type of pExportData.

(NBioAPI_FIR_DATA_TYPE_RAW, NBioAPI_FIR_DATA_TYPE_PROCESSED, …)

phProcessedFIR:
A pointer to a NBioAPI_FIR_HANDLE that receives the FIR handle.

Return Value

NBioAPIERROR_NONE : No error.
NBioAPIERROR_INVALID_HANDLE : Invalid NBioAPI handle.
NBioAPIERROR_INVALID_POINTER : Invalid parameter pointer.
NBioAPIERROR_INVALID_MINSIZE : Invalid minutiae size.

A.3.5 IndexSearch Functions

NBioAPI_InitIndexSearchEngine

NBioAPI_RETURN NBioAPI_InitIndexSearchEngine(NBioAPI_HANDLE hHandle);

Descriptions

This function is to initialize the IndexSearch engine.

Parameters

hHandle:
The handle of the NBioBSP module.

Return Value

NBioAPIERROR_NONE : No error.
NBioAPIERROR_INVALID_HANDLE : Invalid NBioAPI handle.

NBioAPI_TerminateIndexSearchEngine

NBioAPI_RETURN NBioAPI_InitIndexSearchEngine(NBioAPI_HANDLE hHandle);

Descriptions

This function is to close the IndexSearch engine. It must be called before an application is closed to free all memory allocated for the IndexSearch engine.

Parameters

hHandle:
The handle of the NBioBSP module.

Return Value

NBioAPIERROR_NONE : No error.
NBioAPIERROR_INVALID_HANDLE : Invalid NBioAPI handle.
NBioAPI_ERROR_INDEXSEARCH_INIT_FAIL : IndexSearch engine not initialized.

NBioAPI_GetIndexSearchInitInfo

```
NBioAPI_RETURN NBioAPI_GetIndexSearchInitInfo(
        NBioAPI_HANDLE                  hHandle,
        NBioAPI_UINT8                   nStructureType,
        NBioAPI_INIT_INFO_PTR           pInitInfo);
```

Descriptions

This function is to receive the current parameter values of the IndexSearch engine.

Parameters

hHandle:

The handle of the NBioBSP module.

nStructureType :

A integer value indicating the structure type to be output. It must be 0 for current version.

pInitInfo :

A pointer to NBioAPI_INIT_INFO that receives the initialization setting for the IndexSearch engine.

Return Value

NBioAPIERROR_NONE : No error.

NBioAPIERROR_INVALID_HANDLE : Invalid NBioAPI handle.

NBioAPIERROR_INVALID_POINTER : Invalid parameter pointer.

NBioAPI_ERROR_INDEXSEARCH_INIT_FAIL : IndexSearch engine not initialized.

NBioAPIERROR_STRUCTURE_NOT_MATCHED : The structure type of a pointer as the parameter, pInitInfo, is invalid for the nStructureType.

NBioAPI_SetIndexSearchInitInfo

```
NBioAPI_RETURN NBioAPI_SetIndexSearchInitInfo(
        NBioAPI_HANDLE                  hHandle,
        NBioAPI_UINT8                   nStructureType,
        NBioAPI_INIT_INFO_PTR           pInitInfo);
```

Descriptions

This function is to configure the parameter values of the IndexSearch engine.

Parameters

hHandle:

The handle of the NBioBSP module.

nStructureType :

A integer value indicating the structure type to be output. It must be 0 for current version.

pInitInfo :

A pointer to NBioAPI_INIT_INFO containing the initialization setting for the IndexSearch engine.

Return Value

NBioAPIERROR_NONE : No error.

NBioAPIERROR_INVALID_HANDLE : Invalid NBioAPI handle.

NBioAPIERROR_INVALID_POINTER : Invalid parameter pointer.

NBioAPI_ERROR_INDEXSEARCH_INIT_FAIL : IndexSearch engine not initialized.

NBioAPIERROR_STRUCTURE_NOT_MATCHED : The structure type of a pointer as the parameter, pInitInfo, is invalid for the nStructureType.

NBioAPIERROR_INIT_PRESEARCHRATE : Invalid value for PreSearchRate.

NBioAPI_AddFIRToIndexSearchDB

```
NBioAPI_RETURN NBioAPI_AddFIRToIndexSearchDB(
            NBioAPI_HANDLE                              hHandle,
            const NBioAPI_INPUT_FIR_PTR                 pInputFIR,
            NBioAPI_UINT32                              nUserID,
            NBioAPI_INDEXSEARCH_SAMPLE_INFO_PTR         pSampleInfo);
```

Descriptions

This function is to register a fingerprint template data, along with a user ID, into the fingerprint DB on memory. After successful registration, it returns the template information.

Parameters

hHandle:
The handle of the NBioBSP module.

pInputFIR:
A pointer to FIR data to be registered.

nUserID:
A user ID number to be registered.

pSampleInfo:
A pointer to a NBioAPI_INDEXSEARCH_SAMPLE_INFO that receives some information of a registered template, including finger IDs and sample counts.

Return Value

NBioAPIERROR_NONE : No error.
NBioAPIERROR_INVALID_HANDLE : Invalid NBioAPI handle.
NBioAPIERROR_INVALID_POINTER : Invalid parameter pointer.
NBioAPI_ERROR_INDEXSEARCH_INIT_FAIL : IndexSearch engine not initialized.
NBioAPIERROR_UNKNOWN_INPUTFORMAT: Known input format.
NBioAPIERROR_UNKNOWN_FORMAT: Known format.

NBioAPI_RemoveDataFromIndexSearchDB

```
NBioAPI_RETURN NBioAPI_RemoveDataFromIndexSearchDB(
        NBioAPI_HANDLE                          hHandle,
        NBioAPI_INDEXSEARCH_FP_INFO_PTR         pFpInfo);
```

Descriptions

This function is to remove a template data from the fingerprint DB on memory. The parameter, pFpInfo, is used to search the corresponding template data.

Parameters

hHandle:
The handle of the NBioBSP module.

pFpInfo:
A pointer to a NBioAPI_INDEXSEARCH_FP_INFO containing template information including a user ID, finger IDs and sample numbers.

Return Value

NBioAPIERROR_NONE : No error.
NBioAPIERROR_INVALID_HANDLE : Invalid NBioAPI handle.
NBioAPIERROR_INVALID_POINTER : Invalid parameter pointer.
NBioAPIERROR_INDEXSEARCH_INIT_FAIL : IndexSearch engine not initialized.

NBioAPI_RemoveUserFromIndexSearchDB

```
NBioAPI_RETURN NBioAPI_RemoveUserFromIndexSearchDB(NBioAPI_HANDLE hHandle, NBioAPI_UINT32 nUserID);
```

Descriptions

This function is to remove all template data of a user from the fingerprint DB on memory.

Parameters

hHandle:
The handle of the NBioBSP module.

nUserID:
A user ID number to be deleted.

Return Value

NBioAPIERROR_NONE : No error.
NBioAPIERROR_INVALID_HANDLE : Invalid NBioAPI handle.
NBioAPIERROR_INDEXSEARCH_INIT_FAIL : IndexSearch engine not initialized.

NBioAPI_IdentifyDataFromIndexSearchDB

```
NBioAPI_RETURN NBioAPI_IdentifyDataFromIndexSearchDB(
            NBioAPI_HANDLE                             hHandle,
            const NBioAPI_INPUT_FIR_PTR                pInputFIR,
            NBioAPI_FIR_SECURITY_LEVEL                 nSecuLevel,
            NBioAPI_INDEXSEARCH_FP_INFO_PTR            pFpInfo,
            NBioAPI_INDEXSEARCH_CALLBACK_INFO_0* pCallbackInfo0);
```

Descriptions

This function is to perform identification and determine if the same fingerprint exists within the fingerprint DB. After identification, it returns the template information if successful. The callback functions entered through the last parameter, pCallbackInfo0, can be used to determine to skip or stop verification. For more information, please refer to NBioAPI_INDEXSEARCH_CALLBACK_INFO_0 structure.

Parameters

hHandle:
The handle of the NBioBSP module.

pInputFIR:
A pointer to FIR data.

nSecuLevel:
Indicates the security level set for fingerprint recognition. Values range from 1 (lowest) to 9 (highest). The default is 5 (normal).

pFpInfo:
A pointer to a NBioAPI_INDEXSEARCH_FP_INFO that receives template information.

PCallbackInfo0:
A pointer to a NBioAPI_INDEXSEARCH_CALLBACK_INFO_0 containing a set of pointers of callback functions that is to invoked during IndexSearch operation. If NULL, no callback function will be used.

Return Value

NBioAPIERROR_NONE : No error.
NBioAPIERROR_INVALID_HANDLE : Invalid NBioAPI handle.
NBioAPIERROR_INVALID_POINTER : Invalid parameter pointer.
NBioAPIERROR_INDEXSEARCH_INIT_FAIL : IndexSearch engine not initialized.
NBioAPIERROR_INDEXSEARCH_IDENTIFY_FAIL : Failed to find identical template.
NBioAPIERROR_INDEXSEARCH_IDENTIFY_STOP : Identification stopped by callback functions.
NBioAPIERROR_UNKNOWN_INPUTFORMAT: Known input format.
NBioAPIERROR_UNKNOWN_FORMAT: Known format.

NBioAPI_IdentifyDataFromIndexSearchDBEx

```
NBioAPI_RETURN NBioAPI_IdentifyDataFromIndexSearchDBEx(
        NBioAPI_HANDLE                          hHandle,
        const NBioAPI_INPUT_FIR_PTR             pInputFIR,
        NBioAPI_FIR_SECURITY_LEVEL              nSecuLevel,
        NBioAPI_INDEXSEARCH_FP_INFO_PTR         pFpInfo,
        NBioAPI_INDEXSEARCH_CALLBACK_INFO_0* pCallbackInfo0);
```

Descriptions

This function is to perform identification and determine if the same fingerprint exists within the fingerprint DB alone with NBioAPI_IdentifyDataFromIndexSearchDB function.
If identical fingerprint data exist in DB, this function will be calling the callback function twice times than NBioAPI_IdentifyDataFromIndexSearchDB function.

Parameters

hHandle:
The handle of the NBioBSP module.

pInputFIR:
A pointer to FIR data.

nSecuLevel:
Indicates the security level set for fingerprint recognition. Values range from 1 (lowest) to 9 (highest). The default is 5 (normal).

pFpInfo:
A pointer to a NBioAPI_INDEXSEARCH_FP_INFO that receives template information.

PCallbackInfo0:
A pointer to a NBioAPI_INDEXSEARCH_CALLBACK_INFO_0 containing a set of pointers of callback functions that is to invoked during IndexSearch operation. If NULL, no callback function will be used.

Return Value

NBioAPIERROR_NONE : No error.
NBioAPIERROR_INVALID_HANDLE : Invalid NBioAPI handle.
NBioAPIERROR_INVALID_POINTER : Invalid parameter pointer.
NBioAPIERROR_INDEXSEARCH_INIT_FAIL : IndexSearch engine not initialized.
NBioAPIERROR_INDEXSEARCH_IDENTIFY_FAIL : Failed to find identical template.
NBioAPIERROR_INDEXSEARCH_IDENTIFY_STOP : Identification stopped by callback functions.
NBioAPIERROR_UNKNOWN_INPUTFORMAT: Known input format.
NBioAPIERROR_UNKNOWN_FORMAT: Known format.

NBioAPI_SaveIndexSearchDBToFile

```
NBioAPI_RETURN NBioAPI_SaveIndexSearchDBToFile(
            NBioAPI_HANDLE              hHandle,
            const NBioAPI_CHAR*         szFilepath);
```

Descriptions

This function is to backup the fingerprint DB, in memory, into a file.

Parameters

hHandle:

The handle of the NBioBSP module.

szFilepath:

Location and file name to make a DB file.

Return Value

NBioAPIERROR_NONE : No error.

NBioAPIERROR_INVALID_HANDLE : Invalid NBioAPI handle.

NBioAPIERROR_INDEXSEARCH_INIT_FAIL : IndexSearch engine not initialized.

NBioAPIERROR_INDEXSEARCH_SAVE_DB : Failed to save the DB.

NBioAPI_LoadIndexSearchDBFromFile

```
NBioAPI_RETURN NBioAPI_LoadIndexSearchDBFromFile(
            NBioAPI_HANDLE              hHandle,
            const NBioAPI_CHAR*         szFilepath);
```

Descriptions

This function is to load the fingerprint DB file into memory.

Parameters

hHandle:

The handle of the NBioBSP module.

szFilepath:

Location and file name to load a DB file.

Return Value

NBioAPIERROR_NONE : No error.

NBioAPIERROR_INVALID_HANDLE : Invalid NBioAPI handle.

NBioAPIERROR_INDEXSEARCH_INIT_FAIL : IndexSearch engine not initialized.

NBioAPIERROR_INDEXSEARCH_LOAD_DB : Failed to load the DB.

NBioAPI_ClearIndexSearchDB

NBioAPI_RETURN NBioAPI_ClearIndexSearchDB (NBioAPI_HANDLE hHandle);

Descriptions

This function is to delete all template data from the fingerprint DB in memory.

Parameters

hHandle:

The handle of the NBioBSP module.

Return Value

NBioAPIERROR_NONE : No error.

NBioAPIERROR_INVALID_HANDLE : Invalid NBioAPI handle.

NBioAPIERROR_INDEXSEARCH_INIT_FAIL : IndexSearch engine not initialized.

NBioAPI_GetDataCountFromIndexSearchDB

```
NBioAPI_RETURN NBioAPI_GetDataCountFromIndexSearchDB (
            NBioAPI_HANDLE              hHandle,
            NBioAPI_UINT32*             pDataCount);
```

Descriptions

This function is to retrieve the count of template data in the fingerprint DB.

Parameters

hHandle:

The handle of the NBioBSP module.

pDataCount:

A pointer to a NBioAPI_UINT32 that receives the count of template data stored in the fingerprint DB.

Return Value

NBioAPIERROR_NONE : No error.

NBioAPIERROR_INVALID_HANDLE : Invalid NBioAPI handle.

NBioAPIERROR_INVALID_POINTER : Invalid parameter pointer.

NBioAPIERROR_INDEXSEARCH_INIT_FAIL : IndexSearch engine not initialized.

NBioAPI_CheckDataExistFromIndexSearchDB

```
NBioAPI_RETURN NBioAPI_CheckDataExistFromIndexSearchDB (
            NBioAPI_HANDLE                          hHandle,
            NBioAPI_INDEXSEARCH_FP_INFO_PTR         pFpInfo,
            NBioAPI_BOOL*                           pExist);
```

Descriptions

This function is to check if a specific template data exists in the fingerprint DB.

Parameters

hHandle:

The handle of the NBioBSP module.

pFpInfo:

A pointer to template information.

pExist:

A pointer to a BOOL that receives the flag of existence.

Return Value

NBioAPIERROR_NONE : No error.

NBioAPIERROR_INVALID_HANDLE : Invalid NBioAPI handle.

NBioAPIERROR_INVALID_POINTER : Invalid parameter pointer.

NBioAPIERROR_INDEXSEARCH_INIT_FAIL : IndexSearch engine not initialized.

A.3.6 User Interface Functions

NBioAPI_SetSkinResource

NBioAPI_BOOL NBioAPI_SetSkinResource(LPCTSTR szResPath);

Descriptions

This function is used to apply a new skin resource to the NBioBSP module. The skin resource can be made for OEM users.

Parameters

szResPath:

A fullpath of the skin resource file. If NULL, the default resource is used.

Return Value

NBioAPI_TRUE : Successful.

NBioAPI_FALSE : Failed to find the resource DLL. Default resource will be used.

A.3.7 NFIQ Functions

NBioAPI_GetNFIQInfo

```
NBioAPI_RETURN NBioAPI_GetNFIQInfo (
            const NBioAPI_EXPORT_AUDIT_DATA_PTR     pExportAuditData,
            NBioAPI_QUALITY_INFO_PTR_0              pQualityInfo);
```

Descriptions

Gets NFIQ information using Audit information.

Parameters

pExportAuditData: A pointer which Audit information is stored in

pQualityInfo: A pointer to store NFIQ value

Return Value

NBioAPIERROR_NONE : Success

NBioAPIERROR_INVALID_HANDLE : Invalid NBioAPI handle

NBioAPIERROR_INVALID_POINTER : Invalid pointer of parameter

NBioAPI_GetNFIQInfoFromRaw

```
NBioAPI_RETURN NBioAPI_GetNFIQInfoFromRaw (
            const NBioAPI_UINT8* pRawImage,
     const NBioAPI_SINT32 nImgWidth,
     const NBioAPI_SINT32 nImgHeight,
     NBioAPI_SINT32* pNFIQ);
```

Descriptions

Gets NFIQ information using RAW data.

Parameters

pRawImage: A pointer which RAW data is stored in

nImgWidth: Width of RAW data

nImgHeight: Height of RAW data

pNFIQ: A pointer to store NFIQ value

Return Value

NBioAPIERROR_NONE : Success

NBioAPIERROR_INVALID_HANDLE : Invalid NBioAPI handle

NBioAPIERROR_INVALID_POINTER : Invalid pointer of parameter

NBioAPIERROR_FUNCTION_FAIL : Fail to get NFIQ value

NBioAPI_GetNFIQInfoFromHandle

```
NBioAPI_RETURN NBioAPI_GetNFIQInfoFromHandle (
          const NBioAPI_HANDLE              hHandle,
          const NBioAPI_FIR_HANDLE          hAuditData,
          NBioAPI_QUALITY_INFO_PTR_0        pQualityInfo);
```

Descriptions

Gets NFIQ information using FIR handle

Parameters

hHandle: handle of NBioBSP module

hAuditData: handle of input FIR

pQualityInfo: A pointer to store NFIQ value

Return Value

NBioAPIERROR_NONE : Success

NBioAPIERROR_INVALID_HANDLE : Invalid NBioAPI handle

NBioAPIERROR_INVALID_POINTER : Invalid pointer of parameter

NBioAPIERROR_FUNCTION_FAIL : Fail to get NFIQ value

A.3.8 Image Convert Functions

NBioAPI_ImgConvRawToBmpBuf

```
NBioAPI_RETURN NBioAPI_ImgConvRawToBmpBuf (
          IN   LPBYTE      lpImageBuffer,
     IN   UINT        nWidth,
     IN   UINT        nHeight,
     OUT   LPBYTE     lpBMPBuffer,
     OUT   int *      nBMPBufLen);
```

Descriptions

Converts Raw information from FIR to BMP Buffer.

Parameters

lpImageBuffer: Buffer which Raw information is stored in

nWidth: Width of Raw Image from ImageSensor (pixel of HFDU01 : 248).

nHeight: Height of Raw Image from ImageSensor (pixel of HFDU01 : 292).

lpBMPBuffer: Buffer stored in the form of Bmp converted from Raw image

nBMPBufLen: Length of Bmp Buffer

Return Value

NBioAPIERROR_NONE   : Normal Termination

NBioAPIERROR_IMGCONV_INVALID_PARAM : Invalid parameter value

NBioAPIERROR_IMGCONV_MEMALLOC_FAIL : Memory allocation error

NBioAPI_ImgConvRawToBmpBufEx

```
NBioAPI_RETURN NBioAPI_ImgConvRawToBmpBufEx (
            IN    LPBYTE        lpImageBuffer,
        IN    UINT          nWidth,
        IN    UINT          nHeight,
        IN    UINT          nDPI,
        OUT   LPBYTE        lpBMPBuffer,
        OUT   int *         nBMPBufLen);
```

Descriptions

Converts Raw information from FIR to BMP Buffer.

Parameters

lpImageBuffer: Buffer which Raw information is stored in

nWidth: Width of Raw Image from ImageSensor (pixel of HFDU01: 248).

nHeight: Height of Raw Image from ImageSensor (pixel of HFDU01: 292).

nDPI: DPI of Raw Image (NITGEN&COMPANY Image Sensor : 500DPI)

lpBMPBuffer: Buffer stored in the form of Bmp converted from Raw Image

nBMPBufLen: Length of Bmp Buffer

Return Value

NBioAPIERROR_NONE : Normal Termination

NBioAPIERROR_IMGCONV_INVALID_PARAM : Invalid parameter value

NBioAPIERROR_IMGCONV_MEMALLOC_FAIL : Memory allocation error

NBioAPI_ImgConvBmpToRawBuf

```
NBioAPI_RETURN NBioAPI NBioAPI_ImgConvBmpToRawBuf (
        IN       LPBYTE    lpImageBuffer,
        OUT   UINT *       nWidth,
        OUT   UINT *       nHeight,
        OUT   LPBYTE    lpRawBuffer);
```

Descriptions

Gets Buffer value stored in the form of Raw image converted from Bmp

Parameters

lpImageBuffer: Buffer which Bmp image is stored in

nWidth: Width of of Raw Image converted from Bmp (pixel of HFDU01 : 248).

nHeight: Height of Raw Image converted from Bmp (pixel of HFDU01: 292).

lpRawBuffer: Raw Image Buffer converted from Bmp format.

Return Value

NBioAPIERROR_NONE : Normal Termination

NBioAPIERROR_IMGCONV_INVALID_PARAM : Invalid parameter value

NBioAPIERROR_IMGCONV_MEMALLOC_FAIL : Memory allocation error

NBioAPI_ImgConvBmpToRawBufEx

```
NBioAPI_RETURN NBioAPI NBioAPI_ImgConvBmpToRawBufEx (
        IN       LPBYTE    lpImageBuffer,
        IN      UINT     nBmpBufLen,
        OUT   UINT *     nWidth,
        OUT   UINT *     nHeight,
        OUT   LPBYTE   lpRawBuffer);
```

Descriptions

Gets Buffer value in the form of Raw image converted from Bmp format. Used in the case that nWidth value is not a multiple of four.

Parameters

lpImageBuffer: Buffer which Bmp image is stored in
nBmpBufLen: Length of Buffer which Bmp image is stored in
nWidth: Width of Raw Image converted from Bmp format (pixel of HFDU01 : 248).
nHeight: Heigth of Raw Image converted from Bmp format (pixel of HFDU01 : 292).
lpRawBuffer: Raw Image Buffer converted from Bmp format

Return Value

NBioAPIERROR_NONE : Normal Termination
NBioAPIERROR_IMGCONV_INVALID_PARAM : Invalid parameter value
NBioAPIERROR_IMGCONV_MEMALLOC_FAIL : Memory allocation error

NBioAPI_ImgConvRawToJpgBuf

```
NBioAPI_RETURN NBioAPI NBioAPI_ImgConvRawToJpgBuf (
        IN   LPBYTE   lpRawBuffer,
        IN   UINT   nWidth,
        IN   UINT   nHeight,
        IN   int     nQuality,
        OUT   LPBYTE lpJpgBuffer,
              OUT   int *   nJpgBufLen);
```

Descriptions

Gets Buffer value in the form of Jpeg converted from Raw file from FIR.

Parameters

lpRawBuffer: Buffer which Raw Image information is stored in
nWidth: Width of Raw Image from ImageSensor (pixel HFDU01 : 248)
nHeight: Height of Raw Image from ImageSensor (pixel of HFDU01 : 292)
nQuality: Compression ratio for converting to Jpeg format (1 - 100). If compression ratio is set as 100:1, Jpeg file will be larger than its Raw file counterparts.
lpJpgBuffer: Jpeg Buffer converted from Raw file
nJpgBufLen: Size of the Jpeg Buffer. In case of being converted to Jpeg file or stored in DB, this parameter is needed.

Return Value

NBioAPIERROR_NONE : Normal Termination
NBioAPIERROR_IMGCONV_INVALID_PARAM : Invalid parameter value
NBioAPIERROR_IMGCONV_MEMALLOC_FAIL : Memory allocation error

NBioAPI_ImgConvRawToJpgBufEx

```
NBioAPI_RETURN NBioAPI_ImgConvRawToJpgBufEx (
        IN    LPBYTE    lpRawBuffer,

        IN    UINT    nWidth,

        IN    UINT    nHeight,

        IN    int      nQuality,

        IN    UINT nDPI,

        OUT    LPBYTE lpJpgBuffer,

               OUT    int *    nJpgBufLen);
```

Descriptions

Gets Buffer in the form of Jpeg converted from Raw file from FIR.

Parameters

lpRawBuffer: Buffer which Raw information is stored in
nWidth: Width of Raw Image from ImageSensor (pixel of HFDU01 : 248).
nHeight: Height of Raw Image from ImageSensor (pixel of HFDU01 : 292).
nQuality: Compression ratio for converting to Jpeg file (1 - 100). If compression ratio is set as 1:100, Jpeg file will be larger than its Raw file counterparts.
nDPI: DPI of Raw Image (NITGEN&COMPANY Image Sensor : 500DPI)
lpJpgBuffer: Jpeg Buffer converted from Raw file
nJpgBufLen: This parameter is needed in the case of being converted to size.Jpeg of Jpeg Buffer or stored in DB.

Return Value

NBioAPIERROR_NONE   : Normal Termination
NBioAPIERROR_IMGCONV_INVALID_PARAM : Invalid parameter value
NBioAPIERROR_IMGCONV_MEMALLOC_FAIL : Memory allocation error

NBioAPI_ImgConvJpgToRawBuf

```
NBioAPI_RETURN NBioAPI_ImgConvJpgToRawBuf (
        IN       LPBYTE      lpJpgBuffer,

        IN       UINT         nJpgBufLen,

        OUT    UINT *       nWwidth,

        OUT    UINT *       nHheight,

               OUT    LPBYTE      lpRawBuffer);
```

Descriptions

Gets Raw information from Jpeg Buffer.

Parameters

lpJpgBuffer: Jpeg Buffer to get Raw Image information.
nJpgBufLen: Size of Jpeg Buffer. Values same as JpgBufLen from NBioAPI_ImgConvRawToJpgBuf should be entered.
nWidth: Width of Raw Image Buffer from Jpeg Buffer. (i.e. HFDU01 of NITGEN&COMPANY: 248)
nHeight: Heigh of Raw Image Bufferfrom Jpeg Buffer. (i.e. HFDU01of NITGEN&COMPANY: 292)
lpRawBuffer: Raw Image Buffer decompressed from Jpeg Buffer

Return Value

NBioAPIERROR_NONE : Normal Termination
NBioAPIERROR_IMGCONV_INVALID_PARAM : Invalid parameter value
NBioAPIERROR_IMGCONV_MEMALLOC_FAIL : Memory allocation error

NBioAPI_ImgConvRawToWSQBuf

```
NBioAPI_RETURN NBioAPI_ImgConvRawToWSQBuf (
IN   LPBYTE      lpRawBuffer,
IN   int         nWidth,
IN   int         nHeight,
OUT  LPBYTE      lpWSQBuffer,
OUT  int *       nReturn_size,
     IN  float       q);
```

Descriptions
Converts from Raw Buffer to WSQ Buffer.

Parameters
lpRawBuffer: Raw Image Buffer which a user wants to convert to
nWidth: Width of Raw Image. (pixel of HFDU01 : 248).
nHeight: Height of Raw image Buffer (pixel of HFDU01 : 292).
lpWSQBuffer: WSQ Image Buffer converted from Raw Image
nReturn_size: Size of WSQ image converted
q: Quality value of WSQ Image on a scale of 0.1 - 7.0. Its default value is 0.75, which means 15:1. If the quality value was set as high as over 0.75, image distortion gets worse.

Return Value
NBioAPIERROR_NONE : Normal Termination
NBioAPIERROR_IMGCONV_INVALID_PARAM : Invalid parameter value
NBioAPIERROR_IMGCONV_MEMALLOC_FAIL : Memory allocation error

NBioAPI_ImgConvWSQToRawBuf

```
NBioAPI_RETURN NBioAPI_ImgConvWSQToRawBuf (
IN   LPBYTE      lpWSQBuffer,
OUT  LPBYTE      lpRawBuffer,
OUT  int *       nReturn_size,
OUT  int *       nWidth,
     OUT  int *       nHeight);
```

Descriptions
Converts from WSQ Bufferto Raw Buffer.

Parameters
lpWSQBuffer: WSQ Image Buffer which a user wants to convert to
lpRawBuffer: Raw Image Buffer converted from WSQ image

nReturn_size: Size of the Raw Image Buffer converted from WSQ
nWidth: Width of Raw Image Buffer. (i.e. HFDU01 of NITGEN&COMPANY: 248)
nHeight: Height of Raw Image Buffer. (i.e. HFDU01 of NITGEN&COMPANY: 292)

Return Value

NBioAPIERROR_NONE : Normal Termination
NBioAPIERROR_IMGCONV_INVALID_PARAM : Invalid parameter value
NBioAPIERROR_IMGCONV_MEMALLOC_FAIL : Memory allocation error

A.3.9 ISO 19794-4 Convert Functions

NBioAPI_ExportRawToISOV1

```
NBioAPI_RETURN NBioAPI NBioAPI_ExportRawToISOV1 (
        NBioAPI_EXPORT_AUDIT_DATA_PTR        pAuditData,
        NBioAPI_UINT8**                      pISOBuf,
        NBioAPI_UINT32*                      pISOBufLen,
        NBioAPI_BOOL                         bIsRollDevice,
        NBioAPI_UINT8                        nCompressMod);
```

Descriptions

eNBioBSP SDK 의 NBioAPI_NBioBSPToImage API 에서 획득한 지문 이미지 구조체를 ISO 19794-4 데이터로 변환하고 그 결과를 반환하는 API

Parameters

pAuditData: [in] Fingerprint Image structure from NBioAPI_NBioBSPToImage API of eNBioBSP SDK
pISOBuf: [out] Data pointer of ISO 19794-4 is returned.
pISOBufLen: [out] The length of ISO 19794-4 data is returned.
bIsRollDevice: [in] Specifies whether input is Roll Image, NBioAPI_TRUE : Roll Image, NBioAPI_FALSE : Flat Image
nCompressMod: [in] Selects compression mode (Refer to constant number)

Return Value

NBioAPIERROR_NONE : Success
NBioAPIERROR_INVALID_POINTER : Pointer of parameter is invalid.
NBioAPIERROR_FUNCTION_FAIL : Conversion Failure

NBioAPI_ExportRawToISOV2

```
NBioAPI_RETURN NBioAPI NBioAPI_ExportRawToISOV1 (
       NBioAPI_UINT8         nFingerID,
       NBioAPI_UINT16        nImgWidth,
       NBioAPI_UINT16        nImgHeight,
       NBioAPI_UINT8*        pRawBuf,
       NBioAPI_UINT8**       pISOBuf,
       NBioAPI_UINT32*       pISOBufLen,
       NBioAPI_BOOL          bIsRollDevice,
       NBioAPI_UINT8         nCompressMod);
```

Descriptions

API which converts from input Raw Image to ISO 19794-4 data and returns its result

Parameters

nFingerID: [in] Specifies Finger ID (Refer to NBioAPI_FINGER_ID)

nImgWidth: [in] Specifies the width of Raw Image

nImgHeight: [in] Specifies the height of Raw Image

pRawBuf: [in] Raw Image pointer

pISOBuf: [out] Data pointer of ISO 19794-4 is returned.

pISOBufLen: [out] The length of ISO 19794-4 data is returned.

bIsRollDevice: [in] Specifies whether input is Roll Image, NBioAPI_TRUE : Roll Image, NBioAPI_FALSE : Flat Image

nCompressMod: [in] Selects compression mode (Refer to NEXPORT_COMPRESS_MOD)

Return Value

NBioAPIERROR_NONE : Success

NBioAPIERROR_INVALID_POINTER : pointer of parameter is invalid.

NBioAPIERROR_FUNCTION_FAIL : Conversion Failure

NBioAPI_ImportISOToRaw

```
NBioAPI_RETURN NBioAPI_ImportISOToRaw (
        NBioAPI_UINT8*            pISOBuf,
        NBioAPI_UINT32            nISOBufLen,
        NIMPORTRAWSET_PTR    pImportRawSet);
```

Descriptions

API which extracts Raw Image data from ISO 19794-4 data and returns its result

Parameters

pISOBuf: [in] Data pointer of ISO 19794-4

nISOBufLen: [in] Specifies the length of ISO 19794-4 data

pImportRawSet: [out] Raw Images stored in pISOBuf are returned.

Return Value

NBioAPIERROR_NONE : Success

NBioAPIERROR_INVALID_POINTER : Pointer of parameter is invalid.

NBioAPIERROR_FUNCTION_FAIL : Conversion Failure

NBioAPI_ExportRawToANSIV1

```
NBioAPI_RETURN NBioAPI NBioAPI_ExportRawToANSIV1 (
      NBioAPI_EXPORT_AUDIT_DATA_PTR          pAuditData,
      NBioAPI_UINT8**                        pISOBuf,
      NBioAPI_UINT32*                        pISOBufLen,
      NBioAPI_BOOL                           bIsRollDevice,
      NBioAPI_UINT8                          nCompressMod);
```

Descriptions

API which converts from fingerprint image structure from NBioAPI_NBioBSPToImage API of eNBioBSP SDK and returns its result

Parameters

pAuditData: [in] Fingerprint image structure from NBioAPI_NBioBSPToImage API of eNBioBSP SDK

pISOBuf: [out] Data pointer of ISO 19794-4 data is returned.

pISOBufLen: [out] The length of ISO 19794-4 data is returned.

bIsRollDevice: [in] Specifies whether input is Roll Image, NBioAPI_TRUE : Roll Image, NBioAPI_FALSE : Flat Image

nCompressMod: [in] Selects compression mode (Refer to constant number)

Return Value

NBioAPIERROR_NONE : Success

NBioAPIERROR_INVALID_POINTER : Pointer of parameter is invalid.

NBioAPIERROR_FUNCTION_FAIL : Conversion Failure

NBioAPI_ExportRawToANSIV2

```
NBioAPI_RETURN NBioAPI_ExportRawToANSIV2 (
        NBioAPI_UINT8         nFingerID,
        NBioAPI_UINT16        nImgWidth,
        NBioAPI_UINT16        nImgHeight,
        NBioAPI_UINT8*        pRawBuf,
        NBioAPI_UINT8**       pISOBuf,
        NBioAPI_UINT32*       pISOBufLen,
        NBioAPI_BOOL          bIsRollDevice,
        NBioAPI_UINT8         nCompressMod);
```

Descriptions

API which converts Raw Image to ISO 19794-4 data and returns its result

Parameters

nFingerID: [in] Specifies Finger ID (Refer to NBioAPI_FINGER_ID)

nImgWidth: [in] Specifies the width of Raw Image

nImgHeight: [in] Specifies the length of Raw Image

pRawBuf: [in] Raw Image pointer

pISOBuf: [out] Data pointer of ISO 19794-4 data is returned.

pISOBufLen: [out] The length of ISO 19794-4 data is returned.

bIsRollDevice: [in] Specifies whether input is Roll Image, NBioAPI_TRUE : Roll Image, NBioAPI_FALSE : Flat Image

nCompressMod: [in] Selects compression mode (Refer to NEXPORT_COMPRESS_MOD)

Return Value

NBioAPIERROR_NONE : Success

NBioAPIERROR_INVALID_POINTER : Pointer of parameter is invalid.

NBioAPIERROR_FUNCTION_FAIL : Conversion Failure

NBioAPI_ImportANSIToRaw

```
NBioAPI_RETURN NBioAPI_ImportANSIToRaw (
            NBioAPI_UINT8*          pISOBuf,
            NBioAPI_UINT32          nISOBufLen,
            NIMPORTRAWSET_PTR    pImportRawSet);
```

Descriptions

API which extracts Raw Image data from ISO 19794-4 data and returns its result

Parameters

pISOBuf: [in] Data pointer of ISO 19794-4

nISOBufLen: [in] Specifies the length of ISO 19794-4 data

pImportRawSet: [out] Raw Images stored in pISOBuf are returned.

Return Value

NBioAPIERROR_NONE : Success

NBioAPIERROR_INVALID_POINTER : Pointer of parameter is invalid.
NBioAPIERROR_FUNCTION_FAIL : Conversion Failure

NBioAPI_FreeExportISOData

NBioAPI_RETURN NBioAPI_FreeExportISOData (BioAPI_UINT8* pISOBuf);

Descriptions

Deallocates ISO buffer memory.

Parameters

pISOBuf: [in] Data pointer of ISO 19794-4

Return Value

NBioAPIERROR_NONE : Success
NBioAPIERROR_INVALID_POINTER : Pointer of parameter is invalid.
NBioAPIERROR_FUNCTION_FAIL : Conversion Failure

NBioAPI_FreeImportRawSet

NBioAPI_RETURN NBioAPI_FreeImportRawSet (NIMPORTRAWSET_PTR pImportRawSet);

Descriptions

Deallocates the memory of NIMPORTRAWSET structure.

Parameters

pImportRawSet: [in] NIMPORTRAWSET structure pointer

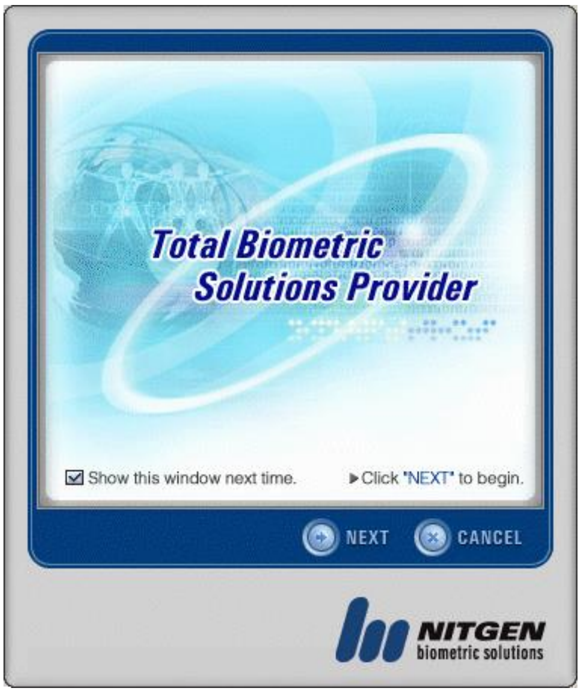
Return Value

NBioAPIERROR_NONE : Success
NBioAPIERROR_INVALID_POINTER : Pointer of parameter is invalid.
NBioAPIERROR_FUNCTION_FAIL : Conversion Failure

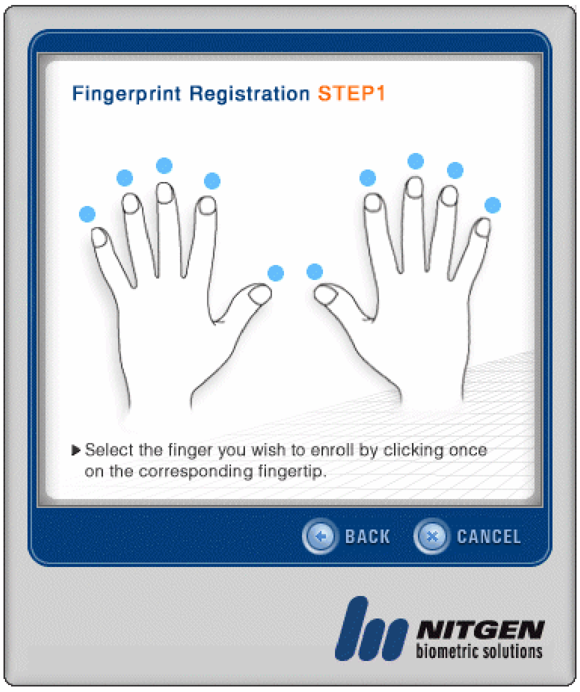
Appendix B. Using the Wizard

B.1 Enrollment Wizard

1. When the NBioAPI “Enroll” function is called, the NBioBSP fingerprint registration wizard is displayed as shown in the diagram below. Click *“Next”* to continue through the fingerprint registration process. The initial welcome screen is optional. If you don't want show this screen next time, please uncheck *“Show this window next time.”*

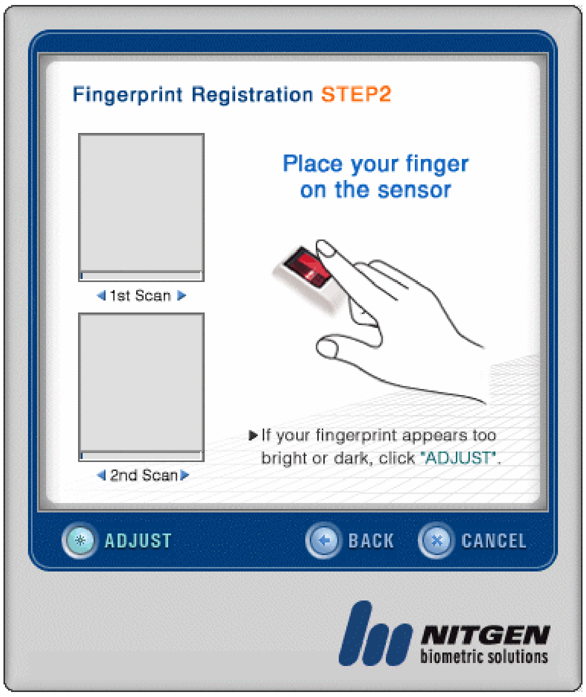

Total Biometric Solutions Provider
Show this window next time.
▶Click "NEXT" to begin.
NEXT
CANCEL
NITGEN biometric solutions

2. When the enrollment process commences, two illustrated hands will appear on the next window shown in the diagram below, corresponding to the user’s hands. Click on the circle above the finger you wish to register.



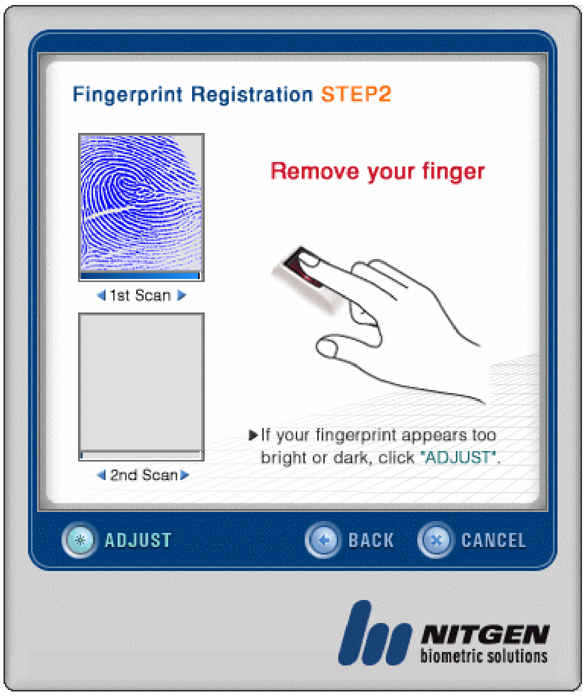
▶Select the finger you wish to enroll by clicking once on the corresponding fingertip.

3. After selecting a finger to enroll, the fingerprint capture window is displayed as shown in the diagram below. Two fingerprint images must be captured from the same finger to complete registration

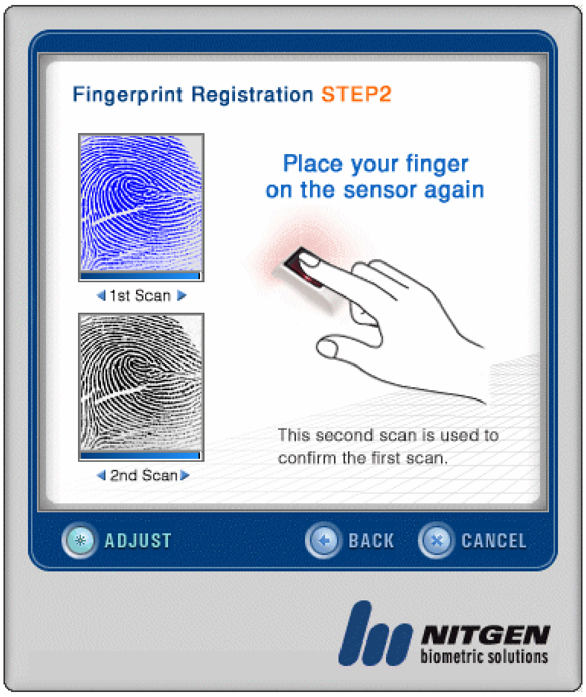

Fingerprint Registration STEP2
Place your finger on the sensor
1st Scan
2nd Scan
If your fingerprint appears too bright or dark, click "ADJUST".
ADJUST
BACK
CANCEL
NITGEN biometric solutions

Note: You may click the "Adjust" button to tune the brightness and contrast of the NITGEN device if the fingerprint image is too dark or too light.

4. When the first fingerprint image has been captured, remove the finger when prompted to do so.


Fingerprint Registration STEP2
Remove your finger
1st Scan
2nd Scan
If your fingerprint appears too bright or dark, click "ADJUST".
ADJUST
BACK
CANCEL
NITGEN biometric solutions

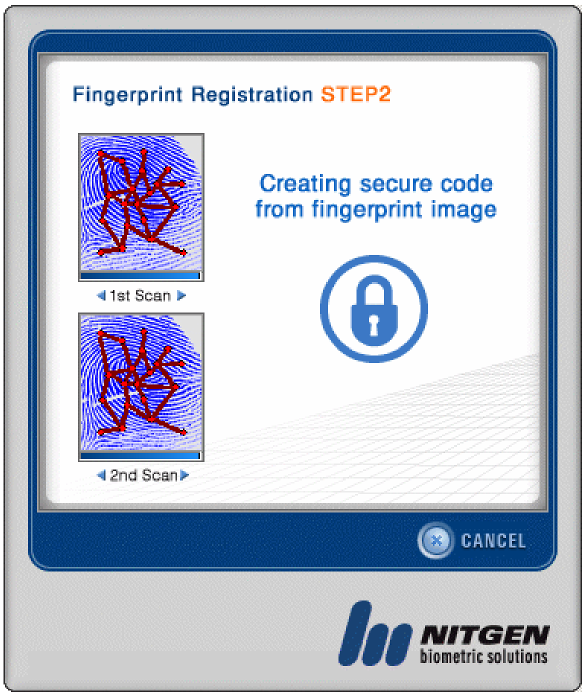
5. Place the **same** finger back on the sensor of the fingerprint reader when prompted to do so. It is necessary to capture a second image of the same finger for the enrollment process to succeed.



Place your finger on the sensor again

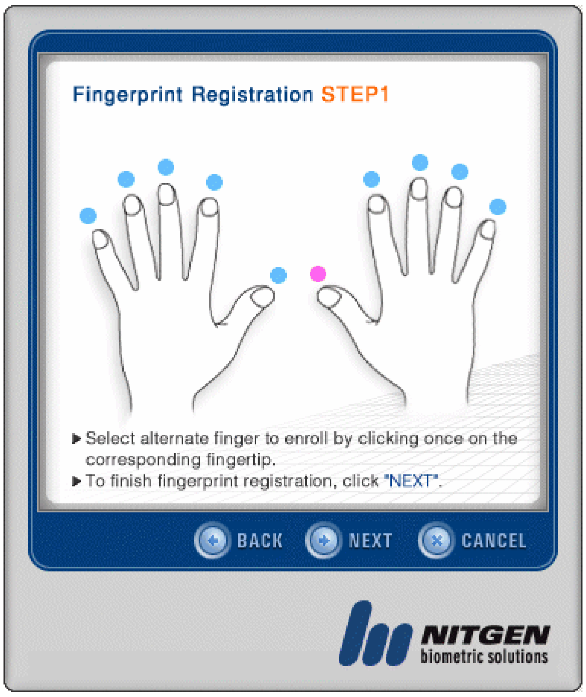
This second scan is used to confirm the first scan.

6. After the second fingerprint has been successfully captured it will be displayed in the "Quality Check" window. During this process, minutiae data is extracted from the fingerprint image, and then all fingerprint image data is erased.



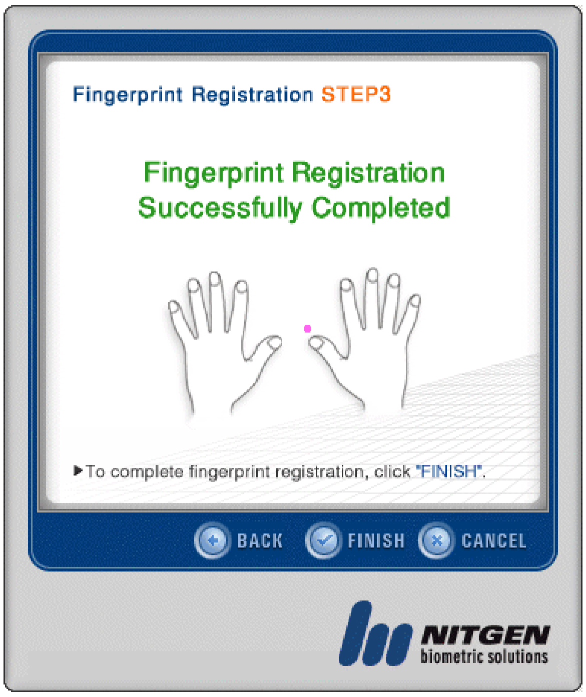
Creating secure code from fingerprint image

7. The circle above the registered finger is now light purple. If you want to register more than one finger, click another finger to enroll. To finish fingerprint registration, click *'NEXT'*. If you select an alternate finger to enroll, the registration process described above will be repeated.



▶ Select alternate finger to enroll by clicking once on the corresponding fingertip.
▶ To finish fingerprint registration, click "NEXT".

8. After the fingerprint registration process has been successfully completed, the dialog shown in the following diagram will be displayed. To complete registration, click *'FINISH'*.

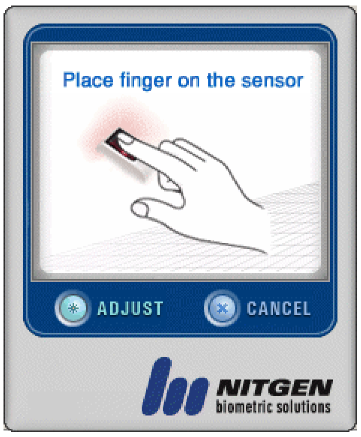


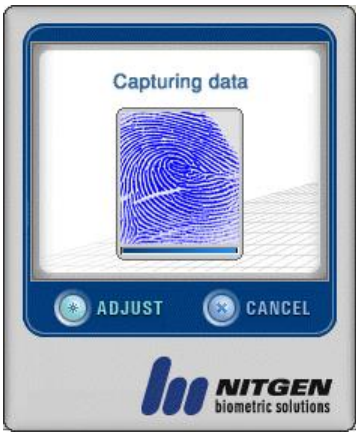
Fingerprint Registration Successfully Completed

▶ To complete fingerprint registration, click "FINISH".

B.2 Verification Wizard

When the NBioAPI “Verify” function is called, the NBioBSP BSP fingerprint verification wizard is displayed. This wizard uses the same user-friendly interface as the fingerprint registration process. Just place the finger on the center of the fingerprint recognition device when prompted. Verification is successful if the user’s fingerprint minutiae score is matched to the enrolled fingerprint template.

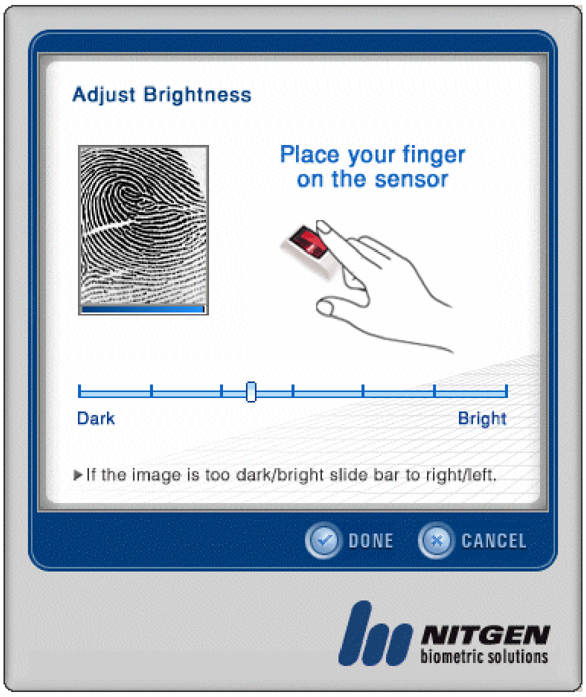




Note: You may click the “Adjust” button to tune the brightness and contrast of the NITGEN device if the fingerprint image is too dark or too light.

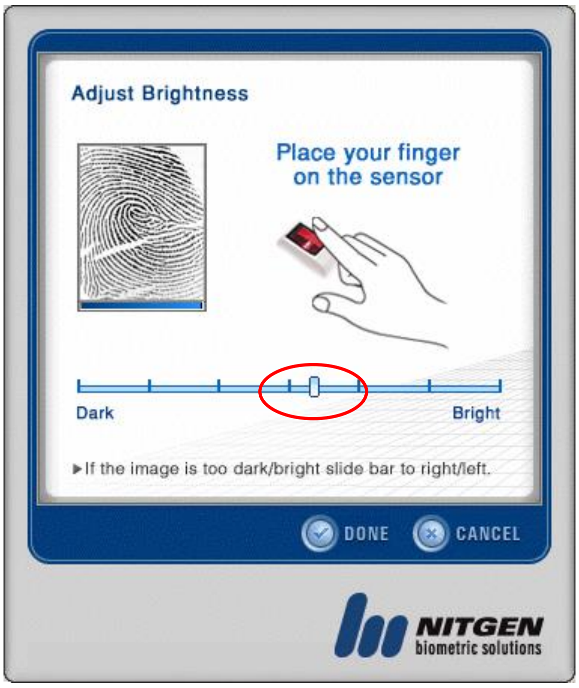
B.3 Brightness adjustment Wizard

For optimal performance it is important to capture good, clear images of the fingerprints for enrollment and verification. If the fingerprint appears to be too dark or too light, click the 'ADJUST' button in either the Registration Wizard or the Verification Wizard. The tuning process requires a fingerprint to be present. Start by positioning your finger or thumb on the NITGEN fingerprint device sensor window when prompted to do so and hold it in place.



▶If the image is too dark/bright slide bar to right/left.

Now, with your finger in place, click and drag the adjustment bar to left (darker image) or right (brighter image). Your fingerprint image will display in the fingerprint image window.　Leaving your finger in place on the sensor, click “Done” when the image is clearly defined (fingerprint ridges and valleys should appear as bright and dark lines).



▶If the image is too dark/bright slide bar to right/left.

Appendix C. Distribution Guide

C / C++ Application (Windows SDK)

Deploy NBioBSP.dll in WINSYSDIR.

C / C++ Application (Linux SDK)

Deploy NBioBSP.dll in /usr/lib

COM Application

Deploy NBioBSP.dll and NBioBSPCOM.dll in WINSYSDIR.
NBioBSPCOM.dll must be registered to windows registry before use
Ex) regsvr32 NBioBSPCOM.dll

.NET Application

Deploy NBioBSP.dll in WINSYSDIR.
Deploy NITGEN.SDK.NBioBSP.dll GAC(Global Assembly Cache) or application run folder.

.NET COM Application

Deploy NBioBSP.dll and NBioBSPCOM.dll in WINSYSDIR.
NBioBSPCOM.dll must be registered to windows registry before use
Ex) regsvr32 NBioBSPCOM.dll

If 64bit OS, deploy NBioBSPCOMLib.dll in WINSYSDIR.

etc

Device driver installed on machine before to use.