Free Fingerprint Verification SDK

Developer's Guide

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Free Fingerprint Verification SDK

1 Preface

The brief information about this developer's guide:

- **Version**: 1.0.0.1
- **Release date**: 2008-12-16

1.1 Copyright Notice

1.2 Questions

After you have read this developer's guide and still have more questions or face troubles in using the Free Fingerprint Verification SDK, please feel free to contact us.

Contacts

- **Email**: freesdk@neurotechnology.com. When writing by email thoroughly describe a problem you face. Also you can attach additional files (eg. screenshots, fingerprint images) which can help solve your problem.

1.3 Feedback

If you have noticed errors, omissions or have suggestions for future improvements, please take a moment to send us feedback via email feedback@neurotechnology.com.

Your feedback will help us to provide the best product.

2 Introduction

Free Fingerprint Verification software development kit (FFV SDK) is a free software component intended for software developers who want to add fingerprint verification functionality in their own software applications. FFV SDK supports various fingerprint scanners and it is able to perform a scanned fingerprint verification against another fingerprint stored in an internal database. The FFV SDK is intended to be used in various logon applications, but it can be also used in any other application.

Additionally, FFV SDK enables developers to use a wide range of programming languages in a development environment of their choice to create applications. This software development kit includes a documentation and sample codes for different programming languages that can be used to guide developers to produce their own applications or add a fingerprint biometric functionality to existing applications.

Free Fingerprint Verification SDK functionality is based on the high level of accuracy Neurotechnology algorithm which is used in VeriFinger SDK and MegaMatcher SDK.

The SDK allows reading fingerprints from scanners and performing fingerprint verification (1:1 matching) only. Quality control can be applied to accept only good quality fingerprints from fingerprint scanners.

2.1 About This Guide

This document is a developer's guide on writing biometrical applications with FFV SDK. When developing your own applications you must be proficient in at least one of these programming languages: C++, C, C#, Delphi, Java, VB .NET, VB6. Also a basic knowledge of biometrical systems is desirable.

2.1.1 How the Guide Is Organized

Chapter *Introduction (see page 2)* focuses on the general information about FFV SDK.

Chapter *Quick Start (see page 12)* provides a quick introduction to the FFV SDK and discusses how to use a fingerprint scanner and sample applications. Also fingerprints enrollment and verification operations are explained.

The components for developing applications that uses the functionality of the FFV SDK are defined in chapter *API Reference (see page 31)*.

Answers to frequently asked questions are reviewed in chapter *FAQ (see page 94)*.

2.1.2 Target Audience

This guide is for developers who have a working experience in programming with at least one of these programming languages: C, C++, C#, Delphi, Java, VB .NET or VB6.

2.2 Additional Resources

This chapter provides additional resources that can help you using the FFV SDK.

2.2.1 About Neurotechnology

Neurotechnology provides algorithms and software development products for biometric fingerprint, iris and face recognition, computer-based vision and object recognition to security companies, system integrators and hardware manufacturers. More than 1,900 system integrators and sensor providers in more than 60 countries license and integrate company's technology into their own products.

Drawing from years of academic research in the fields of neuroinformatics, image processing and pattern recognition, Neurotechnology was founded in 1990 in Vilnius, Lithuania under the name Neurotechnologija and released its first fingerprint identification system in 1991. Since that time Neurotechnology has released more than 40 products and version upgrades for both identification and verification of objects and personal identity.

With a combination of fast algorithms and high reliability, company's fingerprint and face biometric technologies can be used for access control, computer security, banking, time attendance control and law enforcement applications, among others.

Neurotechnology's fingerprint identification algorithm has shown one of the best results for reliability in several biometric competitions, including the International Fingerprint Verification Competition (FVC2006, FVC2004, FVC2002 and FVC2000) and the National Institute of Standards & Technology (NIST) Fingerprint Vendor Technology Evaluation for the US Department of Justice (FpVTE 2003), where Neurotechnology ranked among the top five companies for accuracy in single-finger tests.

2.2.2 Free SDK vs. VeriFinger SDK

Free Fingerprint Verification SDK is based on the same algorithm that is used in VeriFinger SDK and has the same fingerprint features and high matching reliability. The main difference is that VeriFinger SDK is a commercial SDK that offers much more capabilities for software developers.

Free Fingerprint Verification SDK allows to develop biometrical applications that **verify** a scanned fingerprint against a previously stored fingerprint (1-to-1 matching). The SDK **does not** allow to develop applications that read fingerprint images from files or perform fingerprint identification (1-to-many matching). The number of stored fingerprint templates is **limited to 10 records** in the application's database.

VeriFinger SDK allows to develop a wide range of biometrical applications that **identify** fingerprints taken from fingerprint scanner or image files against fingerprints stored in a database (1-to-many matching). Also, VeriFinger SDK does not have any limitations on fingerprint database size and allows to develop both standalone PC-based and Web-based application that use client-server architecture.

Differences between Free Fingerprint Verification SDK and Verifinger SDK are listed in the table below:

Feature	FFV SDK	VeriFinger SDK
Software distribution form	Freeware	Commercial
Technical support	Free	Free
Fingerprint verification (1-to-1 matching)	+	+

Fingerprint verification (1-to-many matching)		+
Fingerprint scanners support	+	+
Fingerprint verification against live scanned image	+	+
High speed identification against database		+
Fingerprint features template extraction from image		+
Fingerprint image files input		+
Programming samples and tutorials	+	+
Database type	Neurotechnology proprietary	Any
Database template count*	10	unlimited
Support for Windows operating systems (2000/XP/Vista)	+	+
Support for Linux operating systems		+
Support for Mac OS X operating system		+
Support for 64 bit operating systems (Windows and Linux)		+

* Database template count is a maximum number of fingerprints that can be saved to a database.

If you need more information about VeriFinger SDK, please visit http://www.neurotechnology.com/vf_sdk.html.

2.2.3 Online Resources

If you need more information about the company or products you can refer to one of these online resources:

Link	Description
http://www.neurotechnology.com/	The Neurotechnology home page. Provides the latest news and updates of Neurotechnology products.
http://www.neurotechnology.com/neurotec-forum/	The Neurotechnology forum. Provides the peer-to-peer connection between Neurotechnology developers and customers.

2.3 System Requirements

The minimal hardware and software requirements needed to run Neurotechnology Free Fingerprint Verification SDK are listed:

- Computer with x86 compatible processor running at 1GHz or better
- Microsoft Windows 2000/XP/2003/Vista operating system
- Microsoft .NET framework 2.0 (for .NET components)
- Microsoft Visual Studio .Net 2005 or newer, or Microsoft Visual Basic 6 (for application development) or Delphi IDE
- A fingerprint scanner that is supported by Free Fingerprint Verification SDK.

2.4 Supported Fingerprint Scanners

The following fingerprint scanners are supported:

Fingerprint scanner model	Description
U.are.U 2000S	• **Description**: The U.are.U 2000 fingerprint scanner is a self-contained sensor for capturing a fingerprint and communicating the digital image to PC via USB interface. The on-board electronics control image capture, self-calibration, and the Plug-n-Play USB interface. • **Manufacturer**: DigitalPersona, Inc. • **Connection**: USB • **Resolution**: 500 dpi • **Supported OS**: Microsoft Windows (32bit)
DigitalPersona U.are.U 4000S / U.are.U 4000B	• **Description**: The U.are.U 4000 fingerprint sensor is designed to work with PC via USB port. It has slim design and small form factor. The on-board electronics control image capture, latent fingerprint rejection, self-calibration, and the Plug-n-Play USB interface. • **Manufacturer**: DigitalPersona, Inc. • **Connection**: USB • **Resolution**: 512 dpi • **Supported OS**: Microsoft Windows (32bit)
DigitalPersona U.are.U Fingerpint Keyboard	• **Description**: This is 104-key Windows compatible keyboard with a built-in U.are.U 4000 fingerprint sensor. The keyboard requires two connections: PS/2 connection for keyboard functioning and USB for fingerprint scanner. • **Manufacturer**: DigitalPersona, Inc. • **Connection**: PS/2 and USB • **Resolution**: 512 dpi • **Supported OS**: Microsoft Windows (32bit)
DigitalPersona U.are.U 4000 Fingerpint Module	• **Description**: The U.are.U 4000 Module is a small fingerprint scanner designed for integration into OEM equipment where fingerprint authentication is needed. • **Manufacturer**: DigitalPersona, Inc. • **Connection**: USB • **Resolution**: 512 dpi • **Supported OS**: Microsoft Windows (32bit)
Cross Match Verifier 300 Classic	• **Description**: This scanner is intended for professional use. It operates via USB port. • **Manufacturer**: Cross Match Technologies Inc. • **Connection**: USB • **Resolution**: 500 dpi • **Supported OS**: Microsoft Windows (32bit)

Cross Match Verifier 300 LC	• **Description**: Verifier 300 LC (Lexan Case) features light weight (less than 0.5 kg). It operates via USB port. • **Manufacturer**: Cross Match Technologies Inc. • **Connection**: USB • **Resolution**: 500 dpi • **Supported OS**: Microsoft Windows (32bit)
Cross Match Verifier 300 LC 2.0	• **Description**: An improved version of Verifier 300 LC. Features faster frame rate and an I/R filter to improve ambient light rejection. • **Manufacturer**: Cross Match Technologies Inc. • **Connection**: USB • **Resolution**: 500 dpi • **Supported OS**: Microsoft Windows (32bit)
Cross Match Verifier 310	• **Description**: This scanner allows to scan two flat fingerprints simultaneously or one rolled fingerprint. • **Manufacturer**: Cross Match Technologies Inc. • **Connection**: USB • **Resolution**: 500 dpi • **Supported OS**: Microsoft Windows (32bit)
Futronic FS80	• **Manufacturer**: Futronic Technology Co. Ltd. • **Connection**: USB 2.0 • **Resolution**: 500 dpi • **Supported OS**: Microsoft Windows (32bit and 64bit), Linux (32 bit)
Futronic eFAM (FS84)	• **Description**: Futronic eFAM provides immediate embedded solution to customers for various kinds of application using fingerprint technology. The scanner can be connected to the host computer using ethernet interface. 2-sensor input and 2-output control signal are available for external device control. Electric lock or other electric device can be activated by eFAM using these output control signals. • **Manufacturer**: Futronic Technology Co. Ltd. • **Connection**: Ethernet • **Resolution**: 500 dpi • **Supported OS**: Microsoft Windows (32bit and 64bit), Linux (32 bit and 64 bit), Mac OS X
Futronic FS88	• **Description**: The scanner is an enhanced version of Futronic FS80 scanner. This scanner was certified by FBI to be compliant with PIV-071006 Image Quality Specification for Singer Finger Reader. The FS88 scanner includes an electronic circuit for **live finger detection**. • **Manufacturer**: Futronic Technology Co. Ltd. • **Connection**: USB 2.0 • **Resolution**: 500 dpi • **Supported OS**: Microsoft Windows (32bit and 64bit), Linux (32 bit)

NITGEN eNBioScan-F	• **Description**: The scanner meets FBI's Integrated AFIS Image Quality Specifications (IQS) and is able to scan wet fingers. • **Manufacturer**: NITGEN Co., Ltd. • **Connection**: USB 2.0 • **Resolution**: 500 dpi • **Supported OS**: Microsoft Windows (32bit), Linux (32 bit)
NITGEN Fingkey Hamster	• **Manufacturer**: NITGEN Co., Ltd. • **Connection**: USB 1.1 • **Resolution**: 500 dpi • **Supported OS**: Microsoft Windows (32bit)
NITGEN Fingkey Hamster II	• **Manufacturer**: NITGEN Co., Ltd. • **Connection**: USB 2.0 • **Resolution**: 500 dpi • **Supported OS**: Microsoft Windows (32bit)
SecuGen Hamster III scanner	• **Manufacturer**: SecuGen Corporation • **Connection**: USB • **Resolution**: 500 dpi • **Supported OS**: Microsoft Windows (32bit), Linux (32 bit)
SecuGen Hamster Plus scanner	• **Manufacturer**: SecuGen Corporation • **Connection**: USB 1.1 • **Resolution**: 500 dpi • **Supported OS**: Microsoft Windows (32bit)
SecuGen Hamster IV scanner	• **Manufacturer**: SecuGen Corporation • **Connection**: USB 2.0 • **Resolution**: 500 dpi • **Supported OS**: Microsoft Windows (32bit)
Dermalog ZF1	• **Description**: The scanner is able to detect fake fingers and to scan both dry and wet fingerprints. • **Manufacturer**: DERMALOG Identification Systems GmbH • **Connection**: USB 2.0 • **Resolution**: 500 dpi • **Supported OS**: Microsoft Windows (32bit)
BioLink U-Match MatchBook v.3.5	• **Manufacturer**: BioLink Solutions • **Connection**: USB 2.0 • **Resolution**: 500 dpi • **Supported OS**: Microsoft Windows (32bit), Linux (32 bit)

Testech Bio-i	• **Manufacturer**: Testech, Inc. • **Connection**: USB 2.0 • **Resolution**: 500 dpi • **Supported OS**: Microsoft Windows (32bit)
Startek FM200 scanner	• **Manufacturer**: Startek Engineering Inc. • **Connection**: USB • **Resolution**: 500 dpi • **Supported OS**: Microsoft Windows (32bit), Linux (32bit and 64bit), Mac OS X
Tacoma CMOS Scanner	• **Manufacturer**: Tacoma Technology Inc. • **Connection**: USB • **Resolution**: 500 dpi • **Supported OS**: Microsoft Windows (32bit), Linux (32bit and 64bit), Mac OS X
Fujitsu MBF200	• **Manufacturer**: Tacoma Technology Inc. and Fujitsu Microelectronics America, Inc. • **Connection**: USB • **Resolution**: 500 dpi • **Supported OS**: Microsoft Windows (32bit), Linux (32bit and 64bit), Mac OS X
Identix DFR 2080	• **Manufacturer**: Identix Inc. • **Connection**: USB 2.0 • **Resolution**: 500 dpi • **Supported OS**: Microsoft Windows (32bit)
Identix DFR 2090	• **Description**: This scanner is intended for professional use. The image output is in USB digital and RS-170 analog video formats. • **Manufacturer**: Identix Inc. • **Connection**: USB, Analog (RS-170) • **Resolution**: 500 dpi • **Supported OS**: Microsoft Windows (32bit)
Identix DFR 2100	• **Manufacturer**: Identix Inc. • **Connection**: USB 2.0 • **Resolution**: 500 dpi • **Supported OS**: Microsoft Windows (32bit)
TST Biometrics BiRD 3	• **Description**: TST Biometrics offers its *touchless sensor technology* that allows to scan a finger without physical contact with a fingerprint sensor. The BiRD 3 sensor is available as desktop scanner, on-wall mounted scanner and as OEM components. Optionally, a 5V AC powered heating device could be included for operating in cold environment. • **Manufacturer**: TST Biometrics • **Connection**: USB 2.0 • **Resolution**: 500 dpi • **Supported OS**: Microsoft Windows (32bit)

Digent Izzix FD1000	• **Manufacturer**:Digent Co. Ltd. • **Connection**: USB 2.0 • **Resolution**: 500 dpi • **Supported OS**: Microsoft Windows (32bit)
UPEK TouchChip TCRU1C	• **Description**: This scanner is built on the TouchChip Silicon Fingerprint Sensor. It communicates PC via USB port. • **Manufacturer**: UPEK, Inc. • **Connection**: USB 1.1 • **Resolution**: 508 dpi • **Supported OS**: Microsoft Windows (32bit)
UPEK TouchChip TCRU2C	• **Manufacturer**: UPEK, Inc. • **Connection**: USB 1.1 • **Resolution**: 508 dpi • **Supported OS**: Microsoft Windows (32bit)
Green Bit DactyScan 26	• **Manufacturer**: Green Bit S.p.A. • **Connection**: USB 2.0 • **Resolution**: 500 dpi • **Supported OS**: Microsoft Windows (32bit)
Hongda S680	• **Description**: This scanner allows to scan rolled fingerprints. A plastic lid can be mounted on top of sensor for more comfortable flat fingerprint scanning. • **Manufacturer**: Hongda Opto-Electron Co., Ltd. • **Connection**: USB 2.0 • **Resolution**: 500 dpi • **Supported OS**: Microsoft Windows (32bit)
Jstac Athena 210	• **Manufacturer**: Jstac Corporation • **Connection**: USB 2.0 • **Resolution**: 500 dpi • **Supported OS**: Microsoft Windows (32bit)
BiometriKa FX 2000	• **Description**: BiometriKa FX 2000 desktop fingerprint scanner is intended for using with PC. Scanner communicates PC via USB interface. FX 2000 contains 32 bit RISC processor for encrypting fingerprint data, controlling scanner operations and other operations. • **Manufacturer**: BiometriKa srl • **Connection**: USB • **Resolution**: 569 dpi • **Supported OS**: Microsoft Windows (32bit), Linux (32 bit)
BiometriKa FX 3000	• **Manufacturer**: BiometriKa srl • **Connection**: USB • **Resolution**: 569 dpi • **Supported OS**: Microsoft Windows (32bit), Linux (32 bit)

BiometriKa HiScan	• **Manufacturer**: BiometriKa srl • **Connection**: USB • **Resolution**: 500 dpi • **Supported OS**: Microsoft Windows (32bit)
Lumidigm Venus Series sensors	• **Manufacturer**:Lumidigm, Inc. • **Connection**: USB • **Resolution**: 500 dpi • **Supported OS**: Microsoft Windows (32bit)
Dakty Fingerprint NAOS-A	• **Description**: A fiber optic fingerprint sensor with live finger detection using human body capacitance, blood oxygen presence and pulse measuring. • **Manufacturer**: Dakty GmbH • **Connection**: USB • **Resolution**: 500 dpi • **Supported OS**: Microsoft Windows (32bit)
id3 Certis Image	• **Description**: An Atmel FingerChip based scanner with a sweeping thermal sensor. • **Manufacturer**: id3 Semiconductors • **Connection**: USB 1.1 • **Resolution**: 500 dpi • **Supported OS**: Microsoft Windows (32bit)
CS-Pass USB Fingerprint Sensor	• **Description**: The CS-Pass USB Fingerprint Sensor is based on AuthenTec AES4000 sensor. It is suitable for PC and mobile devices, including battery powered devices. The sensor can be customized for specific projects. • **Manufacturer**: BiometriCS Ltd. • **Connection**: USB • **Resolution**: 250 dpi • **Supported OS**: Microsoft Windows (32bit), Linux (32 bit and 64 bit), Mac OS X
EntrépPad AES2501B	• **Manufacturer**: AuthenTec, Inc. • **Connection**: USB • **Resolution**: 500 dpi • **Supported OS**: Microsoft Windows (32bit), Linux (32 bit)
EntrépPad AES4000	• **Description**: The AES4000 fingerprint sensor is suitable for PC and mobile devices. Sensor's small size and low power is ideally suited for battery powered devices. • **Manufacturer**: AuthenTec, Inc. • **Connection**: USB • **Resolution**: 250 dpi • **Supported OS**: Microsoft Windows (32bit), Linux (32 bit and 64 bit), Mac OS X

FingerLoc AF-S2	• **Description**: The AF-S2 fingerprint sensor is suitable for the embedded devices. • **Manufacturer**: AuthenTec, Inc. • **Connection**: USB • **Resolution**: 250 dpi • **Supported OS**: Microsoft Windows (32bit), Linux (32 bit and 64 bit), Mac OS X
LTT-C500 Fingerprint Sensor	• **Manufacturer**: LighTuning Technology Inc. • **Connection**: USB • **Resolution**: 508 dpi • **Supported OS**: Microsoft Windows (32bit)
Atmel FingerChip	• **Description**: Please note, that Atmel FingerChip is a whole family of fingerprint sensors. Probably, chip dimensions and image capture area could be different from the presented specifications. Anyway, Neurotechnology's software could be used with any chip from the FingerChip family. • **Manufacturer**: Atmel Corp. • **Connection**: USB • **Resolution**: 500 dpi • **Supported OS**: Microsoft Windows (32bit)
Zvetco Verifi P4000	• **Description**: An USB 2.0 scanner based on AES4000 capacitive sensor. • **Manufacturer**: Zvetco Biometrics • **Connection**: USB 2.0 • **Resolution**: 508 dpi • **Supported OS**: Microsoft Windows (32bit)
Zvetco Verifi P5000	• **Description**: A **FIPS-201 compliant** USB 2.0 fingerprint scanner. The scanner is based on the UPEK TCR1 capacitive sensor, that is also used in TCRU1C fingerprint scanner. P5000 scanner is rugged and scratch resistant. Scanner's sensor has protective coating that is able to withstand more than 10 million touches. • **Manufacturer**: Zvetco Biometrics • **Connection**: USB 2.0 • **Resolution**: 508 dpi • **Supported OS**: Microsoft Windows (32bit)

3 Quick Start

In this chapter is discussed:

- The basic terminology related to fingerprints.
- The instructions for using a fingerprint scanner.
- A guide for using sample applications which are included in FFV SDK.

3.1 Fingerprints

A **fingerprint** is an impression of the friction ridges of all or any part of the finger. Fingerprint recognition systems use characteristics from these ridges (they are also called fingerprint features) to differentiate one fingerprint from another. The Free Fingerprint Verification SDK converts these features to a format (a template) that enables to perform fingerprint enrollment and verification operations efficiently and with high quality.

3.1.1 Enrollment

Enrollment is the process of capturing a person's fingerprint (using a fingerprint capture device). During the enrollment process the FFV SDK saves a person's fingerprint to a database.

When enrolling features from a finger are extracted and saved as a fingerprint template for a future comparison against other fingerprint templates. The following instructions describe a typical fingerprint enrollment scheme (the same scheme is used in sample applications):

1. Get a person's identification number.
2. Capture a person's fingerprint using a fingerprint scanner.
3. Extract a fingerprint features from a fingerprint image.
4. Associate a person with his fingerprint.
5. Save extracted features (a template) to a database.

3.1.2 Verification

Verification is the process when a captured fingerprint is compared to an enrolled fingerprint in order to determine whether the two match.

During a verification a scanned fingerprint is compared with the one saved to a database and is decided whether the two match. The following scheme is usually used for a fingerprint verification:

1. Get a person's identification number.
2. Capture a person's fingerprint using a fingerprint scanner.
3. Extract a fingerprint features from a fingerprint image for the purpose of verification.
4. Get a fingerprint template (the one that was saved to a database earlier) by identification number

5. Compare two fingerprints: the one that was scanned with the one that was saved to database.
6. Perform an action according to the verification result (eg. unlock a computer if two fingerprints matches).

3.2 Quality Threshold

Quality threshold is the property that defines a scanned fingerprint image quality. Quality threshold should be in range [0, 255]. If 255 is set, then only image with best quality threshold will be allowed.

The default quality threshold value is 100.

In the FFV SDK quality threshold can be set using these functions:

```
//.NET property
public byte QualityThreshold;
//C/C++ function
NResult NFFV_API NffvSetQualityThreshold(HNffv hFfv, NByte value);
```

Quality threshold can be in these ranges:

- [0, 99] - low quality
- [100, 199] - medium quality
- [200, 255] - high quality.

3.3 Matching Threshold

Matching threshold - the minimum similarity value that verification and identification functions accept for the same finger fingerprints or face.

Matching threshold should be selected according to the system's development requirements. The default value is 48.

In the FFV SDK matching threshold can be set using these functions and properties:

```
//.NET property
public int MatchingThreshold;
//C/C++ function
NResult N_API NffvSetMatchingThreshold(HNffv hEngine, NInt value);
```

You can convert matching threshold to FAR (false acceptance rate) and vice versa using this table:

FAR (False acceptance rate)	Matching threshold (score)
100 %	0
10 %	12
1 %	24
0.1 %	36
0.01 %	48
0.001 %	60
0.0001 %	72
0.00001 %	84
0.000001 %	96

or using one of these functions:

```
const double ThFARLogRatio = 12;
```

```
NDouble MatchingThresholdToFAR(NInt th)
{
   if(th < 0) th = 0;
   return pow(10.0, -th / ThFARLogRatio + 2);
}
NInt FARToMatchingThreshold(NDouble f)
{
   if(f > 100.0) f = 100.0;
   else
     if(f <= 0.0) f = 1E-100;
   return Round((-log10(f) + 2) * ThFARLogRatio);
}
```

3.4 How to Use Fingerprint Scanner

A **fingerprint scanner** is a device connected to computer and used for capturing a person's fingerprint image. Depending on scanner's manufacturer and model it can be connected to USB or Ethernet port. In order to use a fingerprint scanner with the FFV SDK you should do the following:

- Plug a fingerprint scanner into the USB or Ethernet connector on the system where you copied the FFV SDK files.
- Install the scanner drivers either the one you got from a manufacturer (yours) or from the FFV SDK folder (*install\Fingerprint Scanners*).

3.5 Samples

The FFV SDK contains sample applications which demonstrates the functionality of the FFV SDK. You are free to adjust these applications for your needs.

The sample applications are located in "*Samples*" folder. If you want to test the sample application from this folder, you must first compile or build files from this folder.

There are samples in the following programming languages:

- C++ (*Samples\Cpp*)
- C# (*Samples\CSharp*)
- VB .NET (*Samples\VB.NET*)
- Java (*Samples\Java*)
- Delphi (*Samples\Delphi*)
- VB6 (*Samples\VB6*)

3.5.1 C++

By reading this section you will

- Open a sample application project file and build it
- Enroll a fingerprint
- Make a verification of a fingerprint

If you want to test a sample application without building it, you can find an executable file in *bin\Win32_x86*.

Using C++ sample application

1. **Starting the sample aplication**

Open the solution file using Microsoft Visual Studio 2005 located in the folder "*\Samples\Cpp\CppSample.sln*".

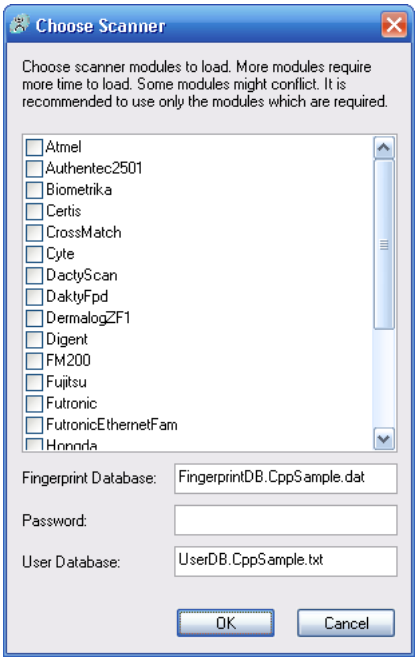
The C++ sample solution project contains these main files:

File	Description
BusyForm.cpp	Form that shows a busy form dialog.
CppSample.sln	C++ sample application solution file.
CppSampleApp.cpp	Defines the class behaviors for the application.
EnrollForm.cpp	Form that shows an enrollment dialog.
MainForm.cpp	Shows main form of sample application.
ScannerListForm.cpp	Shows a dialog for scanners selection.
SettingsForm.cpp	Shows a dialog for selecting application settings.
UserDatabase.cpp	Defines functions for working with users database.
UserPreviewForm.cpp	Shows a form for previewing user's information.

Also you should notice that the solution project contains references to this library:**Nffv.dll.lib**. This library is the main library for your solution projects and provides the enrollment and verification of a fingerprint functionality.

2. **Selecting a fingerprint scanner**

When you have built the sample application solution project and launched it, the dialog box for selecting a scanner appears:



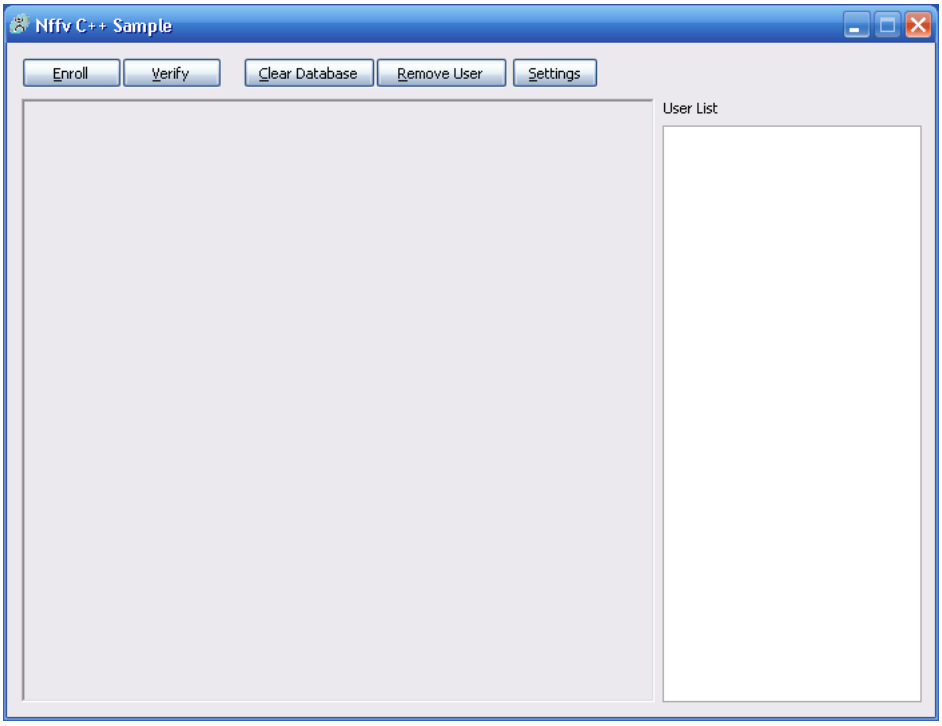
There are listed scanner models supported by the FFV SDK. Select only the scanner models you will use. You should note that more modules require more time to load.

Enrolled fingerprints will be saved to a database (see a fingerprint database field). You can protect this database by setting a password. Person's details are saved to users database (in this sample application users database is a txt file) where a person's name and his fingerprint ID is saved. You can implement your own users database by adding more fields.

3. **The main window of the sample application**

After you have selected fingerprint scanners and pressed the OK button, the main window of the sample application

appears:



Below are listed operation you can do using this sample application:

- Enroll
- Verify
- Remove user
- Clear database
- Settings

Now let's discuss these operations in detail and illustrate them using C++ source code.

4. **Enrolling a fingerprint**

With the purpose of enrolling a fingerprint to database a fingerprint scanner should be connected to a computer. The fingerprint is enrolled by pressing "Enroll" (the dialog box shows up and asks for a name of a person).

Using The FFV SDK you can enroll up to 10 records to a database.

Enrollment (see page 12) of a fingerprint in a sample application is done by using this function:

```
//A thread is created using this function.
UINT CMainForm::EnrollUserThread(LPVOID pParam)
{
    EnrollParam *pEnrollParam = (EnrollParam*)pParam;
    CMainForm* form = (CMainForm*)pEnrollParam->pMainForm;

    //Here an enrollment of a fingerprint is done
    NResult result = NffvEnroll(form->m_iEnrollTimeout, &pEnrollParam->engineStatus,
                      pEnrollParam->pHUser);

    //Enrollment result is checked
    if(NFailed(result)) throw result;

    form->PostMessage(WM_BUSY_FORM_FINISH, 0, (LPARAM)pEnrollParam->pBusyForm);

    return 0;
}
```

5. **Verifying a fingerprint**

When you need to verify a person's fingerprint with the one that was enrolled to a database you should select a database record and press the "Verify" button. After your fingerprint is scanned the verification is made. If the two fingerprints are identical, the matching score is shown. Otherwise, a message box announcing that fingerprints are not identical is shown.

Person's scanned fingerprint verification can be made using this C++ function:

```
//Thread is created. See a sample application for more information
UINT CMainForm::VerifyUserThread(LPVOID pParam)
{
    VerifyParam *pVerifyParam = (VerifyParam*)pParam;
    CMainForm* form = ((CMainForm*)pVerifyParam->pMainForm);

    NResult result = NffvVerify(pVerifyParam->hUser, 20000, &pVerifyParam->engineStatus,
pVerifyParam->pScore);
    if(NFailed(result)) throw result;

    form->PostMessage(WM_BUSY_FORM_FINISH, 0, (LPARAM)pVerifyParam->pBusyForm);

    return 0;
}
```

Note: see API Reference (see page 31) for more information about how to use functionality of the FFV SDK.

3.5.2 C#

By reading this section you will

- Open a sample application project file and build it
- Enroll a fingerprint
- Make a verification of a fingerprint

If you want to test a sample application without building it, you can find an executable file in *\bin\Win32_x86*.

Using C# sample application

1. **Starting the sample aplication**

Open the solution file using Microsoft Visual Studio 2005 located in the folder "*\Samples\CSharp\CSharpSample.sln*".

The C# sample solution project contains these main files:

- *AboutForm.cs*. This file is used for showing a basic information about a sample application.
- *ChooseScannerForm.cs*. This file is used for showing a dialog box for selecting a fingerprint scanner.
- *SettingsForm.cs*. This file is used for showing a form where matching and quality thresholds can be set.
- *MainForm.cs*. This file contains all the main functionality of the application (also methods for fingerprint enrollment and verification).
- *UserInfoForm.cs*. This file contains properties that enable to get or set a user name and fingerprint.

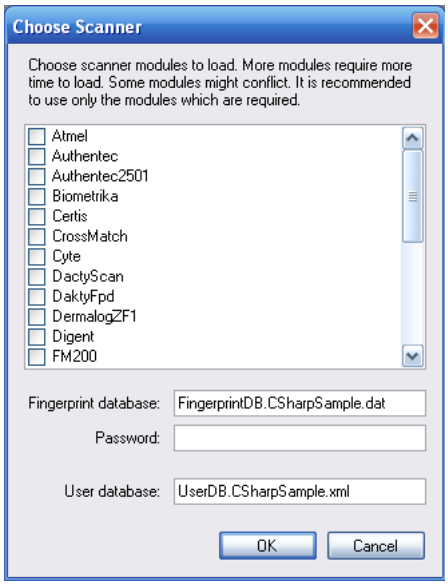
Also you should notice that the solution project contains references to this dynamic-link library (DLL):

- **Neurotec.Biometrics.Nffv.dll**. This library is the main DLL for your solution projects and provides the enrollment and verification of a fingerprint functionality.

These libraries can be located in the "*/bin/Win32_x86*" folder of the FFV SDK.

2. **Selecting a fingerprint scanner**

When you have built the sample application solution project and launched it, the dialog box for selecting a scanner appears:



There are listed scanner models supported by the FFV SDK. Select only the scanner models you will use. You should note that more modules require more time to load.

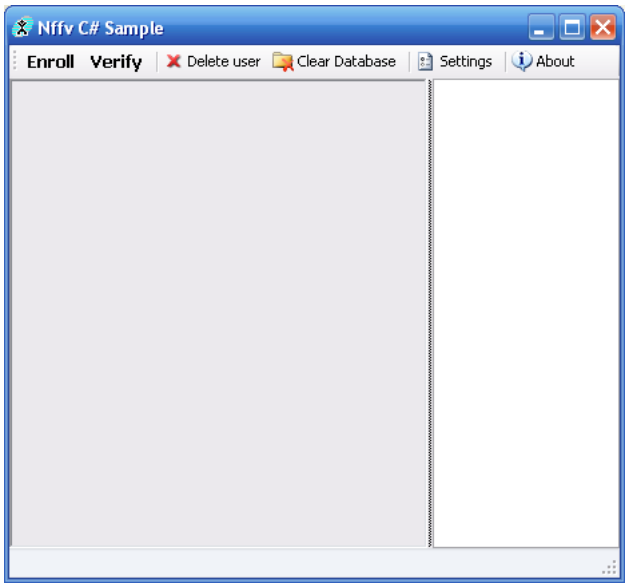
Enrolled fingerprints will be saved to a database (see a fingerprint database field). You can protect this database by setting a password. Person's details are saved to users database (in this sample application users database is an Xml file) where a person's name and his fingerprint ID is saved. You can implement your own users database by adding more fields.

To get the list of scanners supported by the FFV SDK, you can use the following code:

```
//A string variable which contains a list of scanner modules
private string scannerModules = string.Empty;

//Gets a list of supported scanners
scannerModules = Nffv.GetAvailableScannerModules();
```

3. **The main window of the sample application**

After you have selected fingerprint scanners and pressed the OK button, the main window of the sample application appears:



Below are listed operation you can do using this sample application:

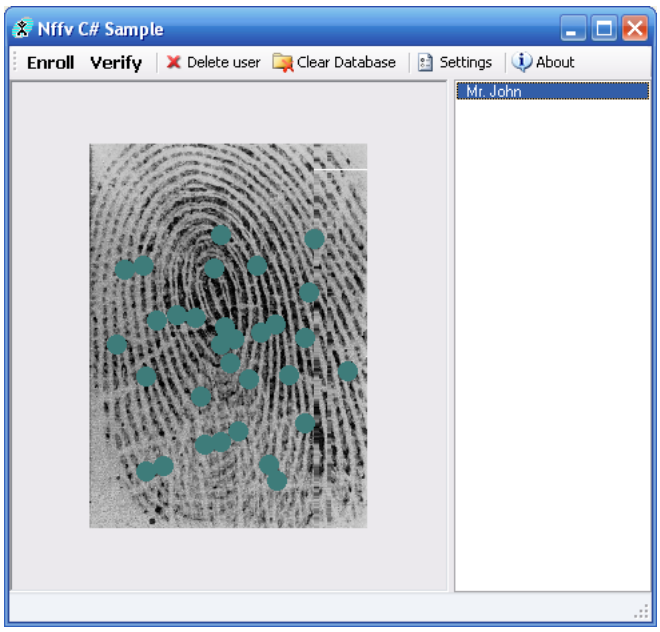
- Enroll
- Verify

- Delete user
- Clear database
- Settings
- About

Now let's discuss these operations in detail and illustrate them using C# source code.

4. **Enrolling a fingerprint**

With the purpose of enrolling a fingerprint to database a fingerprint scanner should be connected to a computer. The fingerprint is enrolled by pressing "Enroll" (the dialog box shows up and asks for a name of a person). After the enrollment of a person's fingerprint has finished you should see a window like this:



A fingerprint image and the name of a person (let's say it is Mr. John) is shown on a window.

Using The FFV SDK you can enroll up to 10 records to a database.

Person's fingerprint can be enrolled using this C# method:

```
public void doEnroll(object sender, DoWorkEventArgs args)
{
   EnrollmentResult enrollmentResults = new EnrollmentResult();
   enrollmentResults.engineUser = _engine.Enroll(20000, out enrollmentResults.engineStatus);
   args.Result = enrollmentResults;
}
```

5. **Verifying a fingerprint**

When you need to verify a person's fingerprint with the one that was enrolled to a database you should select a database record and press the "Verify" button. After your fingerprint is scanned the verification is made. If the two fingerprints are identical, the matching score is shown. Otherwise, a message box announcing that fingerprints are not identical is shown.

Person's scanned fingerprint verification can be made using this C# method:

```
private void doVerify(object sender, DoWorkEventArgs args)
{
    VerificationResult verificationResult = new VerificationResult();
    verificationResult.score = _engine.Verify((NffvUser)args.Argument, 20000,
                               out verificationResult.engineStatus);
    args.Result = verificationResult;
}
```

6. **Deleting a user**

To delete a user from a database you can use this C# method:

```
private Neurotec.Biometrics.Gui.ListBoxImage lbDatabase;
UserDatabase _userDB;
Nffv _engine;

public void DeleteUser ( )
{
   if (lbDatabase.SelectedIndex < 0)
   {
      MessageBox.Show("Please select a record from the database.");
   }
   else
   {
      _userDB.Remove(_userDB.Lookup(((ListBoxImage.CData)lbDatabase.SelectedItem).ID));
      try
      {
         _userDB.WriteToFile(_userDatabaseFile);
      }
      catch { }

      _engine.Users.RemoveAt(lbDatabase.SelectedIndex);
      lbDatabase.Items.RemoveAt(lbDatabase.SelectedIndex);
   }
}
```

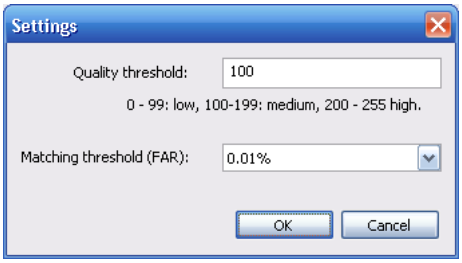
7. **Clearing a database**

When you need to delete all records from a database you can use this C# method:

```
//Fields
Nffv _engine;
private Neurotec.Biometrics.Gui.ListBoxImage lbDatabase;
UserDatabase _userDB;

public void ClearDatabase ( )
{
   if (MessageBox.Show("All records will be deleted from database. Do you want to
continue?",
                       "Confirm delete", MessageBoxButtons.YesNo,
                        MessageBoxIcon.Question) != DialogResult.Yes)
   {
      return;
   }

   //Clears a database
   _engine.Users.Clear();
   lbDatabase.Items.Clear();

   _userDB.Clear();
   try
   {
      _userDB.WriteToFile(_userDatabaseFile);
   }
   catch { }
}
```

8. **Settings**

When you press the "Settings" button you will see a window like this:



For more information on setting quality and matching thresholds see chapters Quality Threshold (see page 13) and Matching Threshold (see page 13).

3.5.3 Delphi

By reading this section you will

- Open a sample application project file and build it
- Enroll a fingerprint
- Make a verification of a fingerprint

If you want to test a sample application without building it, you can find an executable file in *\bin\Win32_x86*.

Using Delphi sample application

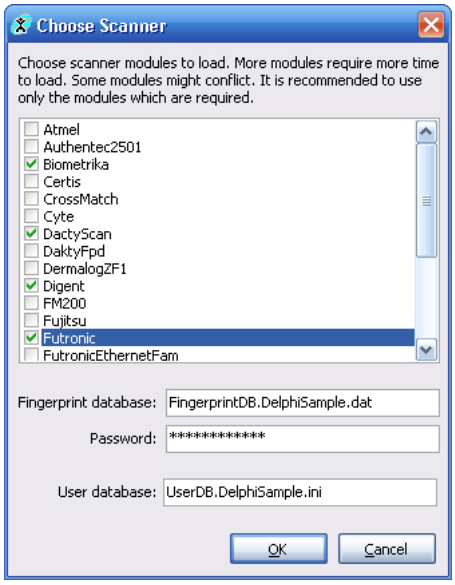
1. **Starting the sample aplication**

Open the project file using Delphi IDE located in the folder "*\Samples\Delphi\DelphiSample.dpr*".

Also you should notice that the solution project contains references to this dynamic-link library (DLL):**Nffv.dll**. This library is the main DLL for your solution projects and provides the enrollment and verification of a fingerprint functionality.

2. **Selecting a fingerprint scanner**

When you have built the sample application solution project and launched it, the dialog box for selecting a scanner appears:



There are listed scanner models supported by the FFV SDK. Select only the scanner models you will use. You should note that more modules require more time to load.

Enrolled fingerprints will be saved to a database (see a fingerprint database field). You can protect this database by setting a password. Person's details are saved to users database (in this sample application users database is an Ini file) where a person's name and his fingerprint ID is saved. You can implement your own users database by adding more fields.

3. **Enrolling a fingerprint**

With the purpose of enrolling a fingerprint to database a fingerprint scanner should be connected to a computer. The fingerprint is enrolled by pressing "Enroll" (the dialog box shows up and asks for a name of a person).

Using The FFV SDK you can enroll up to 10 records to a database.

Enrollment (see page 12) of a fingerprint in a sample application is done by using this procedure:

```
constructor TEnrollmentThread.Create(name: string);
begin
  inherited Create(false);
```

```
  _name := name;
end;

procedure TEnrollmentThread.Execute;
begin
 _user := MForm.Engine.Enroll(20000, _engineStatus);
 Synchronize(UpdateCaption);
end;
```

For more information see a sample application source code.

4. **Verifying a fingerprint**

When you need to verify a person's fingerprint with the one that was enrolled to a database you should select a database record and press the "Verify" button. After your fingerprint is scanned the verification is made. If the two fingerprints are identical, the matching score is shown. Otherwise, a message box announcing that fingerprints are not identical is shown.

Person's scanned fingerprint verification can be made using this Delphi procedure:

```
procedure TMatchingThread.Execute;
begin
  if (_user <> nil) then
   begin
     _score := MForm.Engine.Verify(_user, 20000, _engineStatus);
     Synchronize(UpdateCaption);
   end;
end;
```

For more information see Delphi sample application source code.

Note: see API Reference (see page 31) for more information about how to use functionality of the FFV SDK.

3.5.4 Java

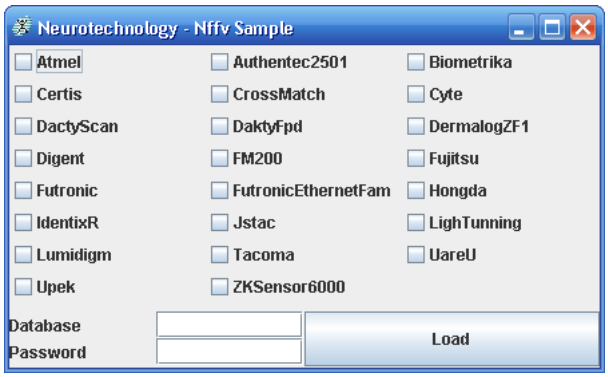
Java sample application's source code is located in a folder *\Samples\Java*. Java sample directory contains these folders:

Directory	Description
include	This folder contains header files which are used by Java Native.
NffvJavaNative	This folder contains a Visual Studio solution file which is used for building NffvJavaNative.dll. This dynamic-link library contains Java native methods.
NffvJavaSample	Contains Java source files used for building Java sample application.
NffvJavaWrapper	Contains files for building a wrapper of the Nffv.dll (see page 31).The Nffv.jar is built which is used in Java applications.
specific	Contains configuration files used by the Java sample application. You do not need to change the contents of these files when developing your own application.

If you take a look at the *bin\Win32_x86* folder of The FFV SDK, you will find that it contains these built files used by Java sample application:

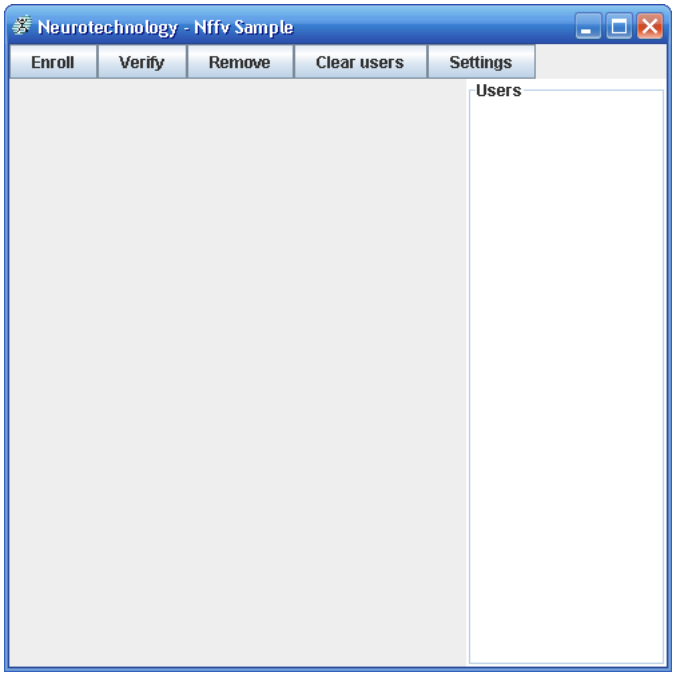
- Nffv.jar - Java archive file which is a wrapper of the Nffv.dll.
- NffvJavaNative.dll - a dynamic-link library that contains native Java methods.
- NffvSample.html - a html file used for loading Java applet. Note that an applet you load should be signed using standard Java signer (from Java SDK).
- NffvSample.jar - Java archive for sample application.

When you launch NffvSample.jar you will see a window like this:



Here you can choose fingerprint scanners to be loaded.

After you have selected a fingerprint scanner, entered a database name and a password for this database (can be an empty password) you will see a window like this:



The usage of this window is similar to the usage of C# sample application (see page 17).

If you want to load a Java sample applet, you can open NffvSample.html file from *bin\Win32_x86* folder.

Building Java sample application

You can also build the same sample application. There is a step-by-step how to build Java sample application:

1. Open Java sample directory (*samples\Java*). Folders from this directory are described above.
2. Open *NffvJavaWrapper* folder and run *build.bat*. Files for Java wrapper are created.
3. Open a Visual Studio solution file *NffvJavaNative.sln* and build it (the file is located under folder *NffvJavaNative*).
4. Open *NffvJavaSample* folder and run *buid.bat*. These files required for Java sample application are created:

- NffvSample.jar
- NffvSample.html

Now you can start using Java sample application whether by opening a jar file or by loading Java applet.

3.5.5 VB.NET

By reading this section you will

- Open a sample application project file and build it
- Enroll a fingerprint
- Make a verification of a fingerprint

If you want to test a sample application without building it, you can find an executable file in *\bin\Win32_x86*.

Using VB.NET sample application

1. **Starting the sample aplication**

Open the solution file using Microsoft Visual Studio 2005 located in the folder "*\Samples\VB.NET\VBNETSample.sln*".

The VB.NET sample solution project contains these main files:

- *AboutForm.vb*. This file is used for showing a basic information about a sample application.
- *ChooseScannerForm.vb*. This file is used for showing a dialog box for selecting a fingerprint scanner.
- *SettingsForm.vb*. This file is used for showing a form where matching and quality thresholds can be set.
- *MainForm.vb*. This file contains all the main functionality of the application (also methods for fingerprint enrollment and verification).
- *UserInfoForm.vb*. This file contains properties that enable to get or set a user name and fingerprint.

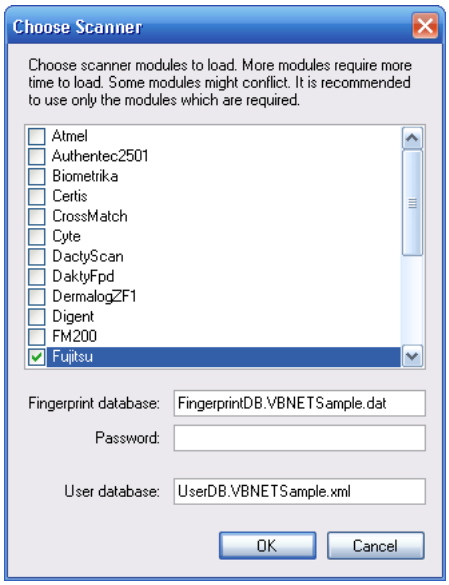
Also you should notice that the solution project contains references to this dynamic-link library (DLL):

- **Neurotec.Biometrics.Nffv.dll**. This library is the main DLL for your solution projects and provides the enrollment and verification of a fingerprint functionality.

These libraries can be located in the "*/bin/Win32_x86*" folder of the FFV SDK.

2. **Selecting a fingerprint scanner**

When you have built the sample application solution project and launched it, the dialog box for selecting a scanner appears:



There are listed scanner models supported by the FFV SDK. Select only the scanner models you will use. You should note that more modules require more time to load.

Enrolled fingerprints will be saved to a database (see a fingerprint database field). You can protect this database by setting a

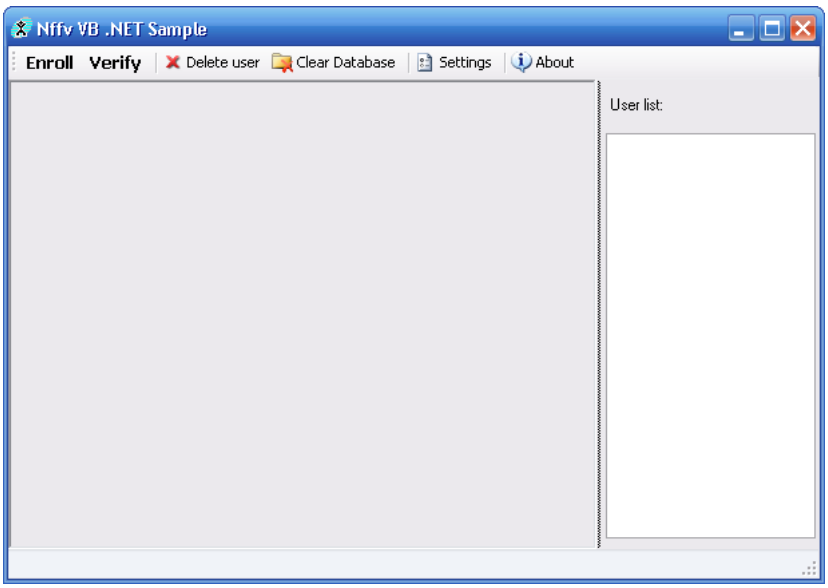
password. Person's details are saved to users database (in this sample application users database is an Xml file) where a person's name and his fingerprint ID is saved. You can implement your own users database by adding more fields.

To get the list of scanners supported by the FFV SDK, you can use the following code:

```
'A string variable which contains a list of scanner modules
Private _allModuleString As String = String.Empty

'Gets a list of supported scanners
_allModuleString = Nffv.GetAvailableScannerModules()
```

3. **The main window of the sample application**

After you have selected fingerprint scanners, created databases and pressed the OK button, the main window of the sample application appears:



Below are listed operation you can do using this sample application:

- Enroll
- Verify
- Delete user
- Clear database
- Settings
- About

Now let's discuss these operations in detail and illustrate them using VB.NET source code.

4. **Enrolling a fingerprint**

With the purpose of enrolling a fingerprint to database a fingerprint scanner should be connected to a computer. The fingerprint is enrolled by pressing "Enroll" (the dialog box shows up and asks for a name of a person).

Using The FFV SDK you can enroll up to 10 records to a database.

Person's fingerprint can be enrolled using this VB.NET method:

```
Private Sub doEnroll(ByVal sender As Object, ByVal args As DoWorkEventArgs)
    Dim enrollmentResults As New EnrollmentResult()
    enrollmentResults.engineUser = _engine.Enroll(20000, enrollmentResults.engineStatus)
    args.Result = enrollmentResults
End Sub
```

5. **Verifying a fingerprint**

When you need to verify a person's fingerprint with the one that was enrolled to a database you should select a database

record and press the "Verify" button. After your fingerprint is scanned the verification is made. If the two fingerprints are identical, the matching score is shown. Otherwise, a message box announcing that fingerprints are not identical is shown.

Person's scanned fingerprint verification can be made using this VB.NET method:

```
Private Sub doVerify(ByVal sender As Object, ByVal args As DoWorkEventArgs)
    Dim verificationResult As New VerificationResult()
    verificationResult.score = _engine.Verify(DirectCast(args.Argument, NffvUser), 20000,
verificationResult.engineStatus)
    args.Result = verificationResult
End Sub
```

6. **Deleting a user**

To delete a user from a database you can use this VB.NET method:

```
Private Sub btnDeleteUser_Click(ByVal sender As Object, ByVal e As EventArgs) Handles
btnDeleteUser.Click
    If lbDatabase.SelectedIndex < 0 Then
      MessageBox.Show("Please select a record from the database.")
    Else
    _userDB.Remove(_userDB.Lookup(DirectCast(lbDatabase.SelectedItem, CData).ID))
    Try
      _userDB.WriteToFile(_userDatabaseFile)
    Catch
    End Try

    _engine.Users.RemoveAt(lbDatabase.SelectedIndex)
    lbDatabase.Items.RemoveAt(lbDatabase.SelectedIndex)
    If (lbDatabase.Items.Count > 0) Then
       lbDatabase.SelectedIndex = 0
    End If
      End If
    End Sub
```

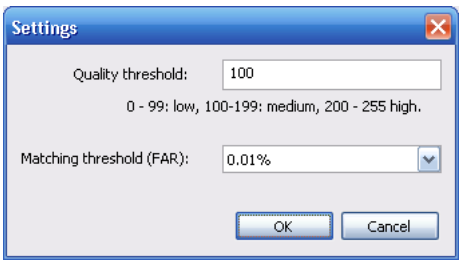
7. **Clearing a database**

When you need to delete all records from a database you can use this VB.NET method:

```
Private Sub btnClearDatabase_Click(ByVal sender As Object, ByVal e As EventArgs) Handles
btnClearDatabase.Click
   If MessageBox.Show("All records will be deleted from database. Do you want to
continue?", "Confirm delete", MessageBoxButtons.YesNo, MessageBoxIcon.Question) <>
DialogResult.Yes Then
     Return
   End If

   _engine.Users.Clear()
   lbDatabase.Items.Clear()

   _userDB.Clear()
   Try
     _userDB.WriteToFile(_userDatabaseFile)
   Catch
   End Try
End Sub
```

8. **Settings**

When you press the "Settings" button you will see a window like this:



For more information on setting quality and matching thresholds see chapters Quality Threshold (see page 13) and

Matching Threshold (see page 13).

3.5.6 VB6

By reading this section you will

- Open a sample application project file and build it
- Enroll a fingerprint
- Make a verification of a fingerprint

If you want to test a sample application without building it, you can find an executable file in *\bin\Win32_x86*.

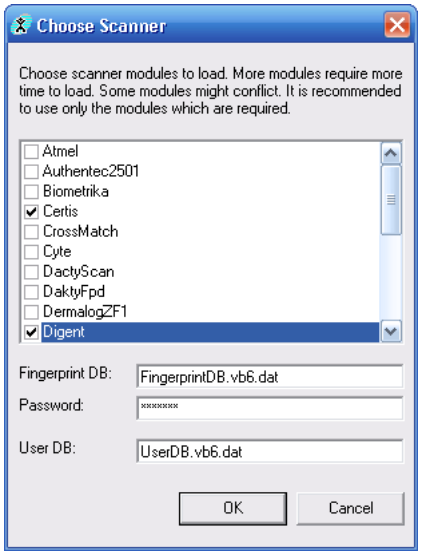
Using VB6 sample application

1. **Starting the sample aplication**

Open Visual Basic 6 p file (*\Samples\VB6\Open Visual Basic 6 Project.bat*). Visual Basic 6 sample application needs the Nffv.dll which provides the main functionality of the FFV SDK.

2. **Selecting a fingerprint scanner**

When you have built the sample application solution project and launched it, the dialog box for selecting a scanner appears:

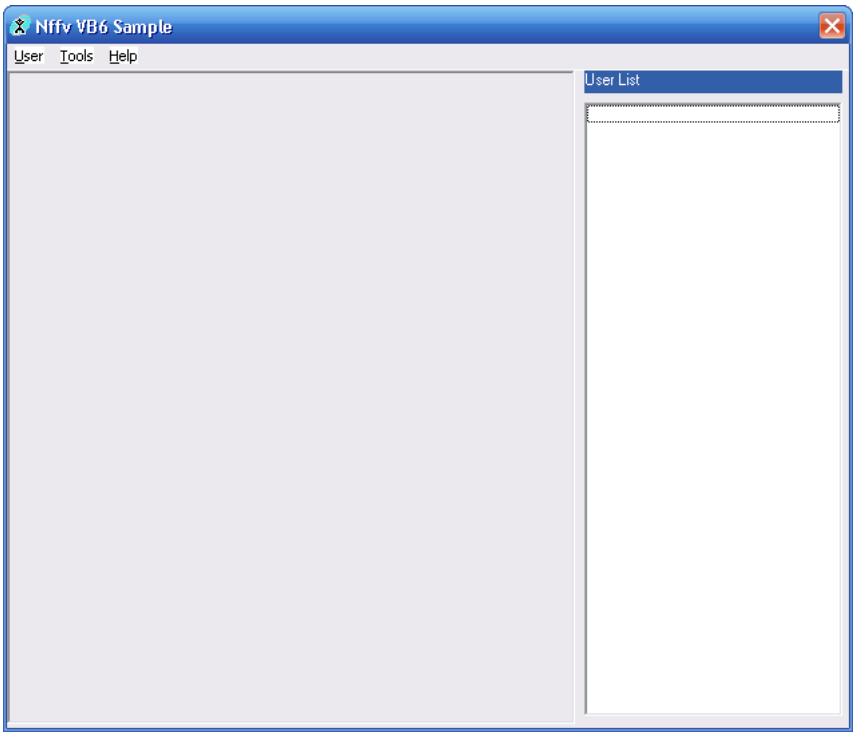


There are listed scanner models supported by the FFV SDK. Select only the scanner models you will use. You should note that more modules require more time to load.

Enrolled fingerprints will be saved to a database (see a fingerprint database field). You can protect this database by setting a password. Person's details are saved to users database (in this sample application users database is a dat file) where a person's name and his fingerprint ID is saved. You can implement your own users database by adding more fields.

3. **The main window of the sample application**

After you have selected fingerprint scanners, created databases and pressed the OK button, the main window of the sample application appears:



Below are listed operation you can do using this sample application:

- Enroll
- Verify
- Delete user
- Clear database
- Settings
- About

Now let's discuss these operations in detail and illustrate them using VB6 source code.

4. **Enrolling a fingerprint**

With the purpose of enrolling a fingerprint to database a fingerprint scanner should be connected to a computer. The fingerprint is enrolled by pressing "Enroll" (the dialog box shows up and asks for a name of a person).

Using The FFV SDK you can enroll up to 10 records to a database.

Person's fingerprint can be enrolled using this VB6 function (the same function is used in the VB6 sample application):

```
Private Sub mnuEnroll_Click()
    On Error GoTo ErrorHandler

    'String identifier for a user
    Dim identifier As String
    'A box shows up asking for entering user's identifier
    identifier = InputBox("Please enter an identifier for new user", "New user identifier")
    If StrPtr(identifier) = 0 Then Exit Sub ' Cancel pressed

    Dim engineUser As NffvUser
    Dim status As NffvStatus
    Dim frmScan As New ScanForm

    'Initializes a fingerprint scanner and tries to get a fingerprint image from it
    frmScan.Show
    frmScan.Refresh
    status = engine.Enroll(20000, engineUser)
    Unload frmScan
    Set frmScan = Nothing
```

```
    'If succeeded a fingerprint is added to database
    If status = nfesTemplateCreated Then
      imgFingerprint.Picture = engineUser.GetImage()
      If identifier = "" Then identifier = Str(engineUser.GetUserId())
      lbDatabase.AddItem identifier
      lbDatabase.ListIndex = lbDatabase.ListCount - 1
    Else
        MsgBox "Failed to enroll: " & Nffv_GetStatusDescription(status)
    End If
    Exit Sub
```

5. **Verifying a fingerprint**

When you need to verify a person's fingerprint with the one that was enrolled to a database you should select a database record and press the "Verify" button. After your fingerprint is scanned the verification is made. If the two fingerprints are identical, the matching score (see page 13) is shown. Otherwise, a message box announcing that fingerprints are not identical is shown.

Person's scanned fingerprint verification can be made using this VB6 function:

```
'This function is used in the VB6 Sample application which is included in the FFV SDK
Private Sub mnuVerify_Click()
    'Checks if a user from database was selected.
    'In order to make a verification you should select user form a list.
    If lbDatabase.ListIndex < 0 Then
        MsgBox "No user selected in User List. Please select/enroll user first.", vbOKOnly
+ vbInformation
        Exit Sub
    End If

    Dim engineUser As NffvUser
    Set engineUser = engine.GetUser(lbDatabase.ListIndex)
    Dim score As Long
    Dim engineStatus As NffvStatus
    Dim frmScan As New ScanForm

    'Initializes a fingerprint scanner and makes a verification
    frmScan.Show
    frmScan.Refresh
    engineStatus = engine.Verify(engineUser, 20000, score)
    Unload frmScan
    Set frmScan = Nothing
    'Checks a matching score. If it is greater than 0 user is verified.
    If engineStatus = nfesTemplateCreated Then
        If score > 0 Then
            MsgBox lbDatabase.List(lbDatabase.ListIndex) & " verified." & vbNewLine &
"Fingerprint matching score: " & score
        Else
             MsgBox lbDatabase.List(lbDatabase.ListIndex) & " not verified." & vbNewLine &
"Fingerprints do not match."
        End If
    Else
        MsgBox "Failed to verify: " & Nffv_GetStatusDescription(engineStatus)
    End If
End Sub
```

6. **Deleting a user**

To delete all users from database you can use this VB6 function:

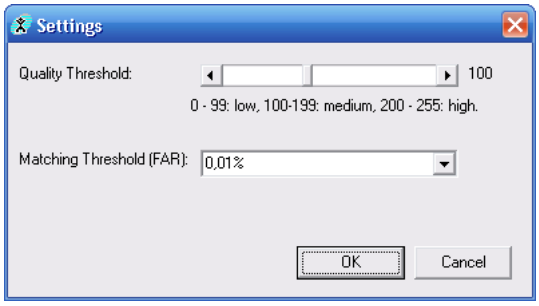
```
'The same function is used in the VB6 sample application.
Private Sub mnuClear_Click()
    'A message box shows up asking for a permission to delete all users from database
    If MsgBox("Do you really want to delete all users from database?", vbYesNo) = vbYes Then
        'ClearUsers function from the Nffv is invoke
        'After that all users are deleted.
        engine.ClearUsers
        lbDatabase.Clear
    End If
End Sub
```

To delete a concrete user from database you can use this VB6 function:

```
'The same function is used in the VB6 sample application
Private Sub mnuDelete_Click()
    'Checks if a user list is not empty.
    If lbDatabase.ListIndex < 0 Then
        MsgBox "No user selected in User List.", vbOKOnly + vbInformation
        Exit Sub
    End If

    'Asks for a permission to delete a user from database.
    If MsgBox("Do you really want to delete selected user from database?", vbYesNo) = vbYes
Then
        Dim previousIndex As Long
        previousIndex = lbDatabase.ListIndex

        engine.RemoveUser lbDatabase.ListIndex
        lbDatabase.RemoveItem lbDatabase.ListIndex

        If previousIndex < lbDatabase.ListCount Then
            lbDatabase.ListIndex = previousIndex
        ElseIf lbDatabase.ListCount > 0 Then
            lbDatabase.ListIndex = lbDatabase.ListCount - 1
        End If
    End If
End Sub
```

7. **Settings**

When you select the "Tools -> Options" you will see a window like this:



This form is used for setting quality and matching thresholds for an application.

For more information on setting quality and matching thresholds see chapters Quality Threshold (see page 13) and Matching Threshold (see page 13).

4 API Reference

This chapter defines the components for developing applications that uses the functionality of the VeriFinger Free SDK.

Modules

Name	Description
C/C++ Reference (see page 31)	This chapter provides the Free Fingerprint Verification SDK programming reference for C/C++ programming languages.
.NET Reference (see page 45)	This chapter provides the Free Fingerprint Verification SDK programming reference for Microsoft .NET framework.
Java Reference (see page 54)	This chapter provides the Free Fingerprint Verification SDK programming reference for Java programming language.
Delphi Reference (see page 73)	This chapter provides the Free Fingerprint Verification SDK programming reference for Delphi programming language.
VB6 Reference (see page 82)	This chapter provides the Free Fingerprint Verification SDK programming reference for VB6 programming language.

4.1 C/C++ Reference

This chapter provides the Free Fingerprint Verification SDK programming reference for C/C++ programming languages.

Remarks

If you are developing your own application using C or C++, you should link **Nffv.dll.lib** library to your solution project. Also **Nffv.dll** library is needed.

In order to use Nffv.dll the folder must contain NffvServer.exe file.

Functions

	Name	Description
	NffvCancel (see page 33)	Cancels a fingerprint enrollment or verification operation.
	NffvClearUsers (see page 33)	Removes all the users which were enrolled to a database.
	NffvEnroll (see page 34)	Gets a fingerprint from a scanner and saves it to a database.
	NffvFreeMemory (see page 34)	Releases memory allocated by the NffvGetAvailableScannerModules function..
	NffvGetAvailableScannerModulesA (see page 35)	Returns available fingerprint scanner modules for usage in the Free Fingerprint Verification SDK.
	NffvGetAvailableScannerModulesW (see page 35)	Returns available fingerprint scanner modules for usage in the Free Fingerprint Verification SDK.
	NffvGetErrorMessageA (see page 35)	Gets an error message. Use this function for errors handling.
	NffvGetErrorMessageW (see page 36)	Gets an error message. Use this function for errors handling.
	NffvGetInfoA (see page 36)	Retrieves information about the Nffv (see page 73) library.
	NffvGetInfoW (see page 36)	Retrieves information about the library.
	NffvGetMatchingThreshold (see page 37)	Gets the minimum similarity value that verification function uses to determine whether the fingerprint matches.
	NffvGetQualityThreshold (see page 37)	Gets an image quality threshold.
	NffvGetUser (see page 37)	Gets the information from a users list about an enrolled user.

	NffvGetUserById (see page 38)	Returns user details by the Id from a database.
	NffvGetUserCount (see page 38)	Retrieves the number of users enrolled to database.
	NffvGetUserIndexById (see page 38)	Retrieves the index from users list of a user indicated by the Id.
	NffvInitializeA (see page 38)	Initializes the FFV. This function as a parameters takes a name and a password of a previously created database or creates a new database.
	NffvInitializeW (see page 39)	Initializes the FFV. This function as a parameters takes a name and a password of a previously created database or creates a new database.
	NffvRemoveUser (see page 40)	Removes a user from users list (database).
	NffvSetMatchingThreshold (see page 40)	Sets the minimum similarity value that verification function uses to determine whether the fingerprint matches.
	NffvSetQualityThreshold (see page 40)	Sets an image quality threshold.
	NffvUninitialize (see page 41)	Releases memory resources.
	NffvUserGetHBitmap (see page 41)	Gets a handle to the bitmap of a user fingerprint.
	NffvUserGetImage (see page 41)	Gets a user's fingerprint image which was enrolled to a database.
	NffvVerify (see page 42)	Compares a captured fingerprint with the one that was enrolled to a database before in order to determine whether two match.

Macros

Name	Description
NFFV_MAX_USER_COUNT (see page 44)	The maximum number of users that can be enrolled to a database.

Structs, Records, Enums

Name	Description
NffvStatus (see page 43)	Enumerates enrollment or verification values of the Nffv (see page 73).
NLibraryInfoA (see page 43)	This structure contains variables that saves information about the library.
NLibraryInfoW (see page 44)	This structure contains variables that saves information about the library.

4

4.1.1 Functions

The following table lists functions in this documentation.

Functions

	Name	Description
	NffvCancel (see page 33)	Cancels a fingerprint enrollment or verification operation.
	NffvClearUsers (see page 33)	Removes all the users which were enrolled to a database.
	NffvEnroll (see page 34)	Gets a fingerprint from a scanner and saves it to a database.
	NffvFreeMemory (see page 34)	Releases memory allocated by the NffvGetAvailableScannerModules function..
	NffvGetAvailableScannerModulesA (see page 35)	Returns available fingerprint scanner modules for usage in the Free Fingerprint Verification SDK.
	NffvGetAvailableScannerModulesW (see page 35)	Returns available fingerprint scanner modules for usage in the Free Fingerprint Verification SDK.
	NffvGetErrorMessageA (see page 35)	Gets an error message. Use this function for errors handling.
	NffvGetErrorMessageW (see page 36)	Gets an error message. Use this function for errors handling.
	NffvGetInfoA (see page 36)	Retrieves information about the Nffv (see page 73) library.
	NffvGetInfoW (see page 36)	Retrieves information about the library.

	NffvGetMatchingThreshold (see page 37)	Gets the minimum similarity value that verification function uses to determine whether the fingerprint matches.
	NffvGetQualityThreshold (see page 37)	Gets an image quality threshold.
	NffvGetUser (see page 37)	Gets the information from a users list about an enrolled user.
	NffvGetUserById (see page 38)	Returns user details by the Id from a database.
	NffvGetUserCount (see page 38)	Retrieves the number of users enrolled to database.
	NffvGetUserIndexById (see page 38)	Retrieves the index from users list of a user indicated by the Id.
	NffvInitializeA (see page 38)	Initializes the FFV. This function as a parameters takes a name and a password of a previously created database or creates a new database.
	NffvInitializeW (see page 39)	Initializes the FFV. This function as a parameters takes a name and a password of a previously created database or creates a new database.
	NffvRemoveUser (see page 40)	Removes a user from users list (database).
	NffvSetMatchingThreshold (see page 40)	Sets the minimum similarity value that verification function uses to determine whether the fingerprint matches.
	NffvSetQualityThreshold (see page 40)	Sets an image quality threshold.
	NffvUninitialize (see page 41)	Releases memory resources.
	NffvUserGetHBitmap (see page 41)	Gets a handle to the bitmap of a user fingerprint.
	NffvUserGetImage (see page 41)	Gets a user's fingerprint image which was enrolled to a database.
	NffvVerify (see page 42)	Compares a captured fingerprint with the one that was enrolled to a database before in order to determine whether two match.

Module

C/C++ Reference (see page 31)

4

4.1.1.1 NffvCancel Function

Cancels a fingerprint enrollment or verification operation.

C++

```
NResult N_API NffvCancel();
```

Returns

If the function succeeds the return value is N_OK. Otherwise the error code (see page 93) is returned.

Remarks

This method is useful when the fingerprint enrollment or verification operation take too long. In this case a cancel dialog can be shown for a user to cancel this operation.

Example

This C++ example demonstrates how to stop an enrollment and verification operation:

```
//...
//Function for cancelling enrollment and verification
void OnCancelScan()
{
    NffvCancel();
}
```

4.1.1.2 NffvClearUsers Function

Removes all the users which were enrolled to a database.

C++

```
NResult N_API NffvClearUsers();
```

Returns

If the function succeeds, the return value is N_OK. Otherwise, an error code (see page 93) is returned.

Remarks

This functions removes all the users that were enrolled to a database, so be careful when using this function.

4.1.1.3 NffvEnroll Function

Gets a fingerprint from a scanner and saves it to a database.

C++

```
NResult N_API NffvEnroll(NUInt timeout, NffvStatus * pStatus, HNffvUser * pHUser);
```

Parameters

Parameters	Description
NUInt timeout	[in] Specifies the time in milliseconds after which the fingerprint scanner stops scanning fingerprint. This usually happens when a finger is removed from a scanner for longer than *timeout* milliseconds.
NffvStatus * pStatus	[out] Enrollment (see page 12) status value enumerated by the NffvStatus (see page 43) enumeration.
HNffvUser * pHUser	[out] A pointer to the FFV user object that provides functions for managing enrolled users.

Returns

If the function succeeds the N_OK value is returned. Otherwise, an error code (see page 93) is returned.

Example

This C++ code demonstrates how to enroll a user:

```
UINT CMainForm::EnrollUserThread(LPVOID pParam)
{
    EnrollParam *pEnrollParam = (EnrollParam*)pParam;
    CMainForm* form = (CMainForm*)pEnrollParam->pMainForm;

    NResult result = NffvEnroll(form->m_iEnrollTimeout, &pEnrollParam->engineStatus,
                                pEnrollParam->pHUser);
    if(NFailed(result)) throw result;

    pEnrollParam->pBusyForm->Stop();

    return 0;
}
```

4.1.1.4 NffvFreeMemory Function

Releases memory allocated by the NffvGetAvailableScannerModules function..

C++

```
void N_API NffvFreeMemory(void * pBlock);
```

Parameters

Parameters	Description
void * pBlock	[out] A pointer to memory block that should be released.

Returns

If the functions succeeds the return value is N_OK. Otherwise, the function returns an error code (see page 93).

4.1.1.5 NffvGetAvailableScannerModulesA Function

Returns available fingerprint scanner modules for usage in the Free Fingerprint Verification SDK.

C++

```
NResult N_API NffvGetAvailableScannerModulesA(NAChar * * pSzValue);
```

Parameters

Parameters	Description
NAChar * * pSzValue	[out] A string that contains the list of scanners separated by semicolons.

Returns

If the function succeeds the return value is N_OK. Otherwise, an error code (see page 93) is returned.

Remarks

This function is an ANSI version of the function.

4.1.1.6 NffvGetAvailableScannerModulesW Function

Returns available fingerprint scanner modules for usage in the Free Fingerprint Verification SDK.

C++

```
NResult N_API NffvGetAvailableScannerModulesW(NWChar * * pSzValue);
```

Parameters

Parameters	Description
NWChar * * pSzValue	[out] A string that contains the list of scanners separated by semicolons.

Returns

If the function succeeds the return value is N_OK. Otherwise, an error code (see page 93) is returned.

Remarks

This function is a Unicode version of the function.

4.1.1.7 NffvGetErrorMessageA Function

Gets an error message. Use this function for errors handling.

C++

```
NInt N_API NffvGetErrorMessageA(NResult code, NAChar * szValue);
```

Parameters

Parameters	Description
NResult code	[in] An error code.
NAChar * szValue	[out] Pointer to memory block that contains an error description.

Returns

If the function succeeds the return value is N_OK. Otherwise, an error code (see page 93) is returned.

Remarks

This function is an ANSI version of the function.

4.1.1.8 NffvGetErrorMessageW Function

Gets an error message. Use this function for errors handling.

C++

```
NInt N_API NffvGetErrorMessageW(NResult code, NWChar * szValue);
```

Parameters

Parameters	Description
NResult code	[in] An error code.
NWChar * szValue	[out] Pointer to memory block that contains an error description.

Returns

If the function succeeds the return value is N_OK. Otherwise, an error code (see page 93) is returned.

Remarks

This function is a Unicode version of the function.

4.1.1.9 NffvGetInfoA Function

Retrieves information about the Nffv (see page 73) library.

C++

```
NResult N_API NffvGetInfoA(NLibraryInfoA * pValue);
```

Parameters

Parameters	Description
NLibraryInfoA * pValue	[out] Pointer to NLibraryInfoA (see page 43) structure that receives library information.

Returns

If the function succeeds the return value is N_OK. Otherwise, an error code (see page 93) is returned.

Remarks

This function is an ANSI version of the function.

4.1.1.10 NffvGetInfoW Function

Retrieves information about the library.

C++

```
NResult N_API NffvGetInfoW(NLibraryInfoW * pValue);
```

Parameters

Parameters	Description
NLibraryInfoW * pValue	[out] Pointer to NLibraryInfoA (see page 43) structure that receives library information.

Returns

If the function succeeds the return value is N_OK. Otherwise, an error code (see page 93) is returned.

Remarks

This function is a Unicode version of the function.

4.1.1.11 NffvGetMatchingThreshold Function

Gets the minimum similarity value that verification function uses to determine whether the fingerprint matches.

C++

```
NResult N_API NffvGetMatchingThreshold(NInt * pValue);
```

Parameters

Parameters	Description
NInt * pValue	[out] Similarity value (matching threshold) for the Nffv. Values are in range [0, MaxInt]. MaxInt is a maximum integer value.

Returns

If the function succeeds the return value is N_OK. Otherwise, an error code (see page 93) is returned.

Remarks

For more information about the matching threshold, please read chapter Matching Threshold (see page 13).

4.1.1.12 NffvGetQualityThreshold Function

Gets an image quality threshold.

C++

```
NResult N_API NffvGetQualityThreshold(NByte * pValue);
```

Parameters

Parameters	Description
NByte * pValue	[out] Quality threshold. The value is in range [0, 255].

Returns

If the function succeeds the return value is N_OK. Otherwise, an error code (see page 93) is returned.

Remarks

For more information about the quality threshold, please read chapter Quality Threshold (see page 13).

4.1.1.13 NffvGetUser Function

Gets the information from a users list about an enrolled user.

C++

```
NResult N_API NffvGetUser(NInt index, HNffvUser * pValue);
```

Parameters

Parameters	Description
NInt index	[in] An index of a user who was enrolled to a database.
HNffvUser * pValue	[out] Information about an enrolled user.

Returns

If the function succeeds the return value is N_OK. Otherwise, an error code (see page 93) is returned.

Remarks

To get an index of a user you can use NffvGetUserIndexById (see page 38) function.

4.1.1.14 NffvGetUserById Function

Returns user details by the Id from a database.

C++

```
NResult N_API NffvGetUserById(NInt id, HNffvUser * pValue);
```

Parameters

Parameters	Description
NInt id	[in] User's identification number in a database. This Id is always unique.
HNffvUser * pValue	[out] Information about a user who was enrolled to a database.

Returns

If the function succeeds the return value is N_OK. Otherwise, an error code (see page 93) is returned.

4.1.1.15 NffvGetUserCount Function

Retrieves the number of users enrolled to database.

C++

```
NResult N_API NffvGetUserCount(NInt * pValue);
```

Parameters

Parameters	Description
NInt * pValue	[out] The number of enrolled users.

Returns

If the function succeeds the return value is N_OK. Otherwise, an error code (see page 93) is returned.

4.1.1.16 NffvGetUserIndexById Function

Retrieves the index from users list of a user indicated by the Id.

C++

```
NResult N_API NffvGetUserIndexById(NInt id, NInt * pValue);
```

Parameters

Parameters	Description
NInt id	[in] The user Id. This Id is used in a users database.
NInt * pValue	[out] An index of a user.

Returns

If the function succeeds the return value is N_OK. Otherwise, an error code (see page 93) is returned.

4.1.1.17 NffvInitializeA Function

Initializes the FFV. This function as a parameters takes a name and a password of a previously created database or creates

a new database.

C++

```
NResult N_API NffvInitializeA(const NAChar * szDbName, const NAChar * szPassword, const
NAChar * szScannerModules);
```

Parameters

Parameters	Description
const NAChar * szDbName	[out] The name of a database. This database will be used to save user fingerprints. The database will be saved to a working folder (or other folder) as a file.
const NAChar * szPassword	[out] A database password. If you don't want to protect a database by password, use a blank a password.
const NAChar * szScannerModules	[out] A list of scanner modules that should be loaded. It is a list of fingerprint scanners that you will use in your application. If the value is an empty string then no scanners are loaded. If the value is null all scanner modules are loaded. Each scanner module in a list should be separated by a semicolon.

Returns

If the function succeeds the return value is N_OK. Otherwise, an error code (see page 93) is returned.

Remarks

This function is an ANSI version of the function.

4.1.1.18 NffvInitializeW Function

Initializes the FFV. This function as a parameters takes a name and a password of a previously created database or creates a new database.

C++

```
NResult N_API NffvInitializeW(const NWChar * szDbName, const NWChar * szPassword, const
NWChar * szScannerModules);
```

Parameters

Parameters	Description
const NWChar * szDbName	[out] The name of a database. This database will be used to save user fingerprints. The database will be saved to a working folder (or other folder) as a file.
const NWChar * szPassword	[out] A database password. If you don't want to protect a database by password, use a blank a password.
const NWChar * szScannerModules	[out] A list of scanner modules that should be loaded. It is a list of fingerprint scanners that you will use in your application. If the value is an empty string then no scanners are loaded. If the value is null all scanner modules are loaded. Each scanner module in a list should be separated by a semicolon.

Returns

If the function succeeds the return value is N_OK. Otherwise, an error code (see page 93) is returned.

Remarks

This function is Unicode version of the function.

4.1.1.19 NffvRemoveUser Function

Removes a user from users list (database).

C++

```
NResult N_API NffvRemoveUser(NInt index);
```

Parameters

Parameters	Description
NInt index	[in] An index number of a user that should be removed from a list.

Returns

If the function succeeds the return value is N_OK. Otherwise, an error code (see page 93) is returned.

Remarks

All enrolled users during the execution of an application are loaded from a database to a list.

4.1.1.20 NffvSetMatchingThreshold Function

Sets the minimum similarity value that verification function uses to determine whether the fingerprint matches.

C++

```
NResult N_API NffvSetMatchingThreshold(NInt value);
```

Parameters

Parameters	Description
NInt value	[in] Similarity value (matching threshold) to set.

Returns

If the function succeeds the return value is N_OK. Otherwise, an error code (see page 93) is returned.

Remarks

For more information about the matching threshold, please read chapter Matching Threshold (see page 13).

The default matching threshold value is 48.

4.1.1.21 NffvSetQualityThreshold Function

Sets an image quality threshold.

C++

```
NResult N_API NffvSetQualityThreshold(NByte value);
```

Parameters

Parameters	Description
NByte value	[in] Quality threshold to set.

Returns

If the function succeeds the return value is N_OK. Otherwise, an error code (see page 93) is returned.

Remarks

For more information about the quality threshold, please read chapter Quality Threshold (see page 13).

The default matching threshold value is 100.

4.1.1.22 NffvUninitialize Function

Releases memory resources.

C++

```
void N_API NffvUninitialize();
```

Returns

If the functions succeeds the return value is N_OK. Otherwise, the function returns an error code (see page 93).

4.1.1.23 NffvUserGetHBitmap Function

Gets a handle to the bitmap of a user fingerprint.

C++

```
NResult N_API NffvUserGetHBitmap(HNffvUser hUser, NHandle * pHBitmap);
```

Parameters

Parameters	Description
HNffvUser hUser	[in] A handle to NffvUser (see page 43) object which is used to manage users.
NHandle * pHBitmap	[out] A handle to a bitmap of the last scanned fingerprint.

Returns

If the function succeeds the return value is N_OK. Otherwise, an error code (see page 93) is returned.

4.1.1.24 NffvUserGetImage Function

Gets a user's fingerprint image which was enrolled to a database.

C++

```
NResult N_API NffvUserGetImage(HNffvUser hUser, NUInt * pWidth, NUInt * pHeight, NFloat *
pHorzResolution, NFloat * pVertResolution, NSizeType * pStride, void * pPixels);
```

Parameters

Parameters	Description
HNffvUser hUser	[in] A handle to user (a user who was enrolled to a database).
NUInt * pWidth	[out] The width of an image.
NUInt * pHeight	[out] The height of an image.
NFloat * pHorzResolution	[out] The horizontal resolution of an image.
NFloat * pVertResolution	[out] The vertical resolution of an image.
NSizeType * pStride	[out] The stride of a fingerprint image. Stride of the image depends on image pixel format and width.
void * pPixels	[out] An image pixel format. If the value is Null then a width, height, resolution and stride of an image is returned. When you have these values you can allocate memory buffer for user image. The size of memory buffer can be calculated using this formula: height * stride.

Returns

If the function succeeds the return value is N_OK. Otherwise, an error code (see page 93) is returned.

4.1.1.25 NffvVerify Function

Compares a captured fingerprint with the one that was enrolled to a database before in order to determine whether two match.

C++

```
NResult N_API NffvVerify(HNffvUser hUser, NUInt timeout, NffvStatus * pStatus, NInt *
pScore);
```

Parameters

Parameters	Description
HNffvUser hUser	[in] A handle to a database record that should be matched with the scanned fingerprint.
NUInt timeout	[in] Specifies the time in milliseconds after which the fingerprint scanner stops scanning fingerprint. This usually happens when a finger is removed from a scanner for longer than *timeout* milliseconds.
NffvStatus * pStatus	[out] One of the verification status values enumerated in NffvStatus (see page 43).
NInt * pScore	[out] A matching score of two fingerprints verification.

Returns

If the function succeeds the return value is N_OK. Otherwise, an error code (see page 93) is returned.

Example

This C++ example demonstrates how to verify two fingerprints:

```
UINT CMainForm::VerifyUserThread(LPVOID pParam)
{
    VerifyParam *pVerifyParam = (VerifyParam*)pParam;
    CMainForm* form = ((CMainForm*)pVerifyParam->pMainForm);

    NResult result = NffvVerify(pVerifyParam->hUser, 20000,
                     &pVerifyParam->engineStatus, pVerifyParam->pScore);
    if(NFailed(result)) throw result;

    pVerifyParam->pBusyForm->Stop();

    return 0;   // thread completed successfully
}
```

4.1.2 Structs, Records, Enums

The following table lists structs, records, enums in this documentation.

Enumerations

Name	Description
NffvStatus (see page 43)	Enumerates enrollment or verification values of the Nffv (see page 73).

Module

C/C++ Reference (see page 31)

Structures

Name	Description
NLibraryInfoA (see page 43)	This structure contains variables that saves information about the library.
NLibraryInfoW (see page 44)	This structure contains variables that saves information about the library.

4.1.2.1 NffvStatus Enumeration

Enumerates enrollment or verification values of the Nffv (see page 73).

C++

```
typedef enum NffvStatus {
  nfesNone = 0,
  nfesTemplateCreated = 1,
  nfesNoScanner = 2,
  nfesScannerTimeout = 3,
  nfesUserCanceled = 4,
  nfesQualityCheckFailed = 100
} NffvStatus;
```

Members

Members	Description
nfesTemplateCreated = 1	Indicates that the fingerprint template was created.
nfesNoScanner = 2	Indicates that there is no fingerprint scanner connected.
nfesScannerTimeout = 3	Indicates that the fingerprint scanner has reached the timeout.
nfesUserCanceled = 4	Indicates that a user has canceled a fingerprint scanning.
nfesQualityCheckFailed = 100	Indicates that the Free Fingerprint Verification SDK had failed to check the quality of a fingerprint.

4.1.2.2 NLibraryInfoA Structure

This structure contains variables that saves information about the library.

C++

```
typedef struct NLibraryInfoA {
  NAChar Title[N_LI_TITLE_MAX_LENGTH];
  NAChar Product[N_LI_PRODUCT_MAX_LENGTH];
  NAChar Company[N_LI_COMPANY_MAX_LENGTH];
  NAChar Copyright[N_LI_COPYRIGHT_MAX_LENGTH];
  NInt VersionMajor;
  NInt VersionMinor;
  NInt VersionBuild;
  NInt VersionRevision;
  NInt DistributorId;
  NInt SerialNumber;
} NLibraryInfoA;
```

Remarks

This structure is an ANSI version.

Members

Members	Description
NAChar Title[N_LI_TITLE_MAX_LENGTH];	Title of the library.
NAChar Product[N_LI_PRODUCT_MAX_LENGTH];	Name of a product that uses the library.
NAChar Company[N_LI_COMPANY_MAX_LENGTH];	Name of company that released the library.
NAChar Copyright[N_LI_COPYRIGHT_MAX_LENGTH];	Copyright notice of the library.
NInt VersionMajor;	Major version number of the library.
NInt VersionMinor;	Minor version number of the library.
NInt VersionBuild;	Build version number of the library.
NInt VersionRevision;	Revision version number of the library.
NInt DistributorId;	This field is unused.

NInt SerialNumber;	This field is unused.

4.1.2.3 NLibraryInfoW Structure

This structure contains variables that saves information about the library.

C++

```
typedef struct NLibraryInfoW {
  NWChar Title[N_LI_TITLE_MAX_LENGTH];
  NWChar Product[N_LI_PRODUCT_MAX_LENGTH];
  NWChar Company[N_LI_COMPANY_MAX_LENGTH];
  NWChar Copyright[N_LI_COPYRIGHT_MAX_LENGTH];
  NInt VersionMajor;
  NInt VersionMinor;
  NInt VersionBuild;
  NInt VersionRevision;
  NInt DistributorId;
  NInt SerialNumber;
} NLibraryInfoW;
```

Remarks

This structure is a Unicode version.

Members

Members	Description
NWChar Title[N_LI_TITLE_MAX_LENGTH];	Title of the library.
NWChar Product[N_LI_PRODUCT_MAX_LENGTH];	Name of a product that uses the library.
NWChar Company[N_LI_COMPANY_MAX_LENGTH];	Name of company that released the library.
NWChar Copyright[N_LI_COPYRIGHT_MAX_LENGTH];	Copyright notice of the library.
NInt VersionMajor;	Major version number of the library.
NInt VersionMinor;	Minor version number of the library.
NInt VersionBuild;	Build version number of the library.
NInt VersionRevision;	Revision version number of the library.
NInt DistributorId;	This field is unused.
NInt SerialNumber;	This field is unused.

4.1.3 Macros

The following table lists macros in this documentation.

Macros

Name	Description
NFFV_MAX_USER_COUNT (see page 44)	The maximum number of users that can be enrolled to a database.

Module

C/C++ Reference (see page 31)

4.1.3.1 NFFV_MAX_USER_COUNT Macro

The maximum number of users that can be enrolled to a database.

C++

```
#define NFFV_MAX_USER_COUNT 10
```

Notes

You can not change this value.

4.2 .NET Reference

This chapter provides the Free Fingerprint Verification SDK programming reference for Microsoft .NET framework.

Remarks

If you are developing your own application using one of a .NET programming language, you should include this dynamic-link library into your biometric solution project:

- Neurotec.Biometrics.Nffv.dll (contains enrollment and verification methods). This Dll is a wrapper of the Nffv.dll (see page 31).

Nffv.dll file should be located in the same folder as Neurotec.Biometrics.Nffv.dll. Also NffvServer.exe is required for using Neurotec.Biometrics.Nffv.dll.

Namespaces

Name	Description
Neurotec.Biometrics (see page 45)	Contains classes and methods that provide the Free Fingerprint Verification SDK functionality.

4.2.1 Neurotec.Biometrics Namespace

Contains classes and methods that provide the Free Fingerprint Verification SDK functionality.

Module

.NET Reference (see page 45)

Classes

	Name	Description
	Nffv (see page 46)	The main class of the Free Fingerprint Verification SDK. Provides methods and properties for working with user collection and enrolling or verifying user fingerprints.
	NffvUser (see page 52)	Provides methods and properties for working with users.

Structs, Records, Enums

	Name	Description
	NffvStatus (see page 53)	Enumerates enrollment or verification status values.

4.2.1.1 Classes

The following table lists classes in this documentation.

Classes

	Name	Description
	Nffv (see page 46)	The main class of the Free Fingerprint Verification SDK. Provides methods and properties for working with user collection and enrolling or verifying user fingerprints.
	NffvUser (see page 52)	Provides methods and properties for working with users.

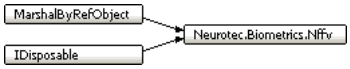
4.2.1.1.1 Nffv Class

The main class of the Free Fingerprint Verification SDK. Provides methods and properties for working with user collection and enrolling or verifying user fingerprints.

C#

```
public class Nffv : MarshalByRefObject, IDisposable;
```

Class Hierarchy



Methods

	Name	Description
	Nffv (see page 46)	Initializes a new instance of the Nffv class. During the initialization a new database is created or used previously created.

Nffv Classes

	Name	Description
	UserCollection (see page 48)	Represents a collection of NffvUsers objects that represent the user fingerprints enrolled to a database.

Nffv Fields

	Name	Description
	DllName (see page 49)	The name of a dynamic-linked library which contains unmanaged functionality of the Free Fingerprint Verification SDK.
	MaxUserCount (see page 50)	The maximum number of users that can be enrolled to a database.

Nffv Methods

	Name	Description
	Cancel (see page 50)	Cancels a fingerprint enrollment or verification operation.
	Dispose (see page 50)	Disposes resources used by the Nffv.
	Enroll (see page 50)	Gets a fingerprint from a scanner and saves it to a database.
S	GetAvailableScannerModules (see page 51)	Returns available fingerprint scanner modules for usage in the Free Fingerprint Verification SDK.
	GetUserById (see page 51)	Returns a user details by the Id from the UserCollection (see page 48).
	Verify (see page 51)	Compares a captured fingerprint with the one that was enrolled to a database before in order to determine whether two match.

Nffv Properties

	Name	Description
	MatchingThreshold (see page 52)	Gets or sets the minimum similarity value that verification method uses to determine whether the fingerprint matches.
	QualityThreshold (see page 52)	Gets or sets image quality threshold.

4.2.1.1.1.1 Nffv Constructor

4.2.1.1.1.1.1 Nffv.Nffv Constructor (string, string)

Initializes a new instance of the Nffv class. During the initialization a new database is created or used previously created.

C#

```
public Nffv(string dbName, string password);
```

Parameters

Parameters	Description
string dbName	A name of database. This database will be used to save user fingerprints. The database will be saved to a working folder as a file.
string password	A database password. If you don't want to protect a database by password, use an empty string as a password.

Example

This C# example code demonstrates how to create a new instance of the Nffv calss.

```
string dbName = "FingerprintsDatabase.dat";
string password = "passwd";

Neurotec.Biometrics.Nffv engine = null;

//Creates a new instance of the Nffv class
engine = new Neurotec.Biometrics.Nffv(dbName, password);
```

The same example code for VB.NET:

```
Dim dbName As String = "FingerprintsDatabase.dat"
Dim password As String = "passwd"

Dim engine As Global.Neurotec.Biometrics.Nffv = Nothing

engine = New Global.Neurotec.Biometrics.Nffv(dbName, password)
```

4.2.1.1.1.1.2 Nffv.Nffv Constructor (string, string, string)

Initializes a new instance of the Nffv class. During the initialization a new database is created or used previously created.

C#

```
public Nffv(string dbName, string password, string scannerModules);
```

Parameters

Parameters	Description
string dbName	A name of database. This database will be used to save user fingerprints. The database will be saved to a working folder as a file.
string password	A database password. If you don't want to protect a database by password, use an empty string as a password.
string scannerModules	A list of scanner modules that should be loaded. It is a list of fingerprint scanners that you will use in your application. Each fingerprint scanner's name in the scanner module is separated by semicolon.

Remarks

For the list of available fingerprint scanners see a chapter Supported Scanners.

Example

This C# example code demonstrates how to create a new instance of the Nffv calss.

```
string dbName = "FingerprintsDatabase.dat";
string password = "passwd";
string scanners = "Upek;Futronic";

Neurotec.Biometrics.Nffv engine = null;

//Creates a new instance of the Nffv class
engine = new Neurotec.Biometrics.Nffv(dbName, password, scanners);
```

The same example code for VB.NET:

```
Dim dbName As String = "FingerprintsDatabase.dat"
```

```
Dim password As String = "passwd"
Dim scanners As String = "Upek;Futronic"

Dim engine As Global.Neurotec.Biometrics.Nffv = Nothing

engine = New Global.Neurotec.Biometrics.Nffv(dbName, password, scanners)
```

4.2.1.1.1.2 Nffv Classes

4.2.1.1.1.2.1 Nffv.UserCollection Class

Represents a collection of NffvUsers objects that represent the user fingerprints enrolled to a database.

C#

```
[Serializable]
public sealed class UserCollection : CollectionBase;
```

Class Hierarchy

Notes

This class is a sealed class, so it has a limited extensibility (other classes cannot inherit from it).

UserCollection Methods

	Name	Description
	Add (see page 48)	Adds a user to a UserCollection.
	Contains (see page 49)	Returns a Boolean value indicating whether a UserCollection object contains an element with a specified key.
	IndexOf (see page 49)	Returns an index of the UserCollection item specified by Id.

4.2.1.1.1.2.1.1 UserCollection Methods

4.2.1.1.1.2.1.1.1 Nffv.UserCollection.Add Method

Adds a user to a UserCollection (see page 48).

C#

```
internal NffvUser Add(IntPtr hUser);
```

Parameters

Parameters	Description
IntPtr hUser	A reference to an object that represents a user which should be added to a collection.

Example

To add a user to database you can use this C# code:

```
public class UserEnrollment
{
    UserDatabase _userDB;
    _userDB.Add(new UserRecord(engineUser.Id, userName));
}

public class UserRecord
{
   //...
   public UserRecord(int id, string name)
   {
      _id = id;
      _name = name;
   }
}
```

4.2.1.1.1.2.1.1.2 Nffv.UserCollection.Contains Method

Returns a Boolean value indicating whether a UserCollection (see page 48) object contains an element with a specified key.

C#

```
public bool Contains(int id);
```

Parameters

Parameters	Description
int id	An integer value that specifies the Id for which to search the element of the collection.

Returns

A Boolean value indicating whether the UserCollection (see page 48) contains an elements with the specified Id.

If the return value is True, the collection contains an element with an Id specified. Otherwise, the return value is False.

Example

This C# example demonstrates how to use this method:

```
int id = 3;

if UserCollection.Contains(id)
   MsgBox("The desired user is in collection");
else
   MsgBox("The desired user was not find in a collection");
```

The VB.NET code this method:

```
Dim id As Integer = 3

If UserCollection.Contains(id) Then
    MsgBox("The desired user is in the collection.")
Else
    MsgBox("The desired user was not find in the collection.")
End If
```

4.2.1.1.1.2.1.1.3 Nffv.UserCollection.IndexOf Method

Returns an index of the UserCollection (see page 48) item specified by Id.

C#

```
public int IndexOf(int id);
```

Parameters

Parameters	Description
int id	The Id of a user to search in a collection.

Returns

A collection index of a user specified by Id.

4.2.1.1.1.3 Nffv Fields

4.2.1.1.1.3.1 Nffv.DllName Field

The name of a dynamic-linked library which contains unmanaged functionality of the Free Fingerprint Verification SDK.

C#

```
public const string DllName = "Nffv.dll";
```

4.2.1.1.1.3.2 Nffv.MaxUserCount Field

The maximum number of users that can be enrolled to a database.

C#

```
public const int MaxUserCount = 10;
```

Remarks

You can add up-to 10 users to a database.

4.2.1.1.1.4 Nffv Methods

4.2.1.1.1.4.1 Nffv.Cancel Method

Cancels a fingerprint enrollment or verification operation.

C#

```
public void Cancel();
```

Remarks

This method is useful when the fingerprint enrollment or verification operation take too long. In this case a message box can be shown for a user to cancel this operation.

Example

This C# code demonstrates how to cancel enrollment or verification operation:

```
Nffv engine;

engine.Cancel();
```

The same code using VB.NET notation:

```
Private engine As Nffv

engine.Cancel()
```

4.2.1.1.1.4.2 Nffv.Dispose Method

Disposes resources used by the Nffv (see page 46).

C#

```
public void Dispose();
```

4.2.1.1.1.4.3 Nffv.Enroll Method

Gets a fingerprint from a scanner and saves it to a database.

C#

```
public NffvUser Enroll(uint timeout, out NffvStatus status);
```

Parameters

Parameters	Description
uint timeout	Specifies the time in milliseconds after which the fingerprint scanner stops scanning fingerprint. This usually happens when a finger is removed from a scanner for longer than *timeout* milliseconds.
out NffvStatus status	Enrollment (see page 12) status value indicated by one of the value enumerated in NffvStatus (see page 53).

Returns

A reference to NffvUser (see page 52) object which provides methods for managing enrolled users.

If there were problem enrolling a fingerprint, the method returns a zero pointer.

Example

This C# example demonstrates the usage of the *Enroll* method:

```
//Field that holds a reference to Nffv object
Nffv engine;

//Internal class that saves the result of fingerprint enrolment
internal class EnrollmentResult
{
    public NffvStatus engineStatus;
    public NffvUser engineUser;
};

//Method used for a fingerprint enrollment
public void doEnroll(object sender, DoWorkEventArgs args)
{
    EnrollmentResult enrollmentResults = new EnrollmentResult();
    enrollmentResults.engineUser = engine.Enroll(20000, out enrollmentResults.engineStatus);
    args.Result = enrollmentResults;
}
```

4.2.1.1.1.4.4 Nffv.GetAvailableScannerModules Method

Returns available fingerprint scanner modules for usage in the Free Fingerprint Verification SDK.

C#

```
public static string GetAvailableScannerModules();
```

Returns

A string that contains the list of scanners separated by semicolons.

4.2.1.1.1.4.5 Nffv.GetUserById Method

Returns a user details by the Id from the UserCollection (see page 48).

C#

```
public NffvUser GetUserById(int id);
```

Parameters

Parameters	Description
int id	User's identification number in a collection.

Returns

A reference to the NffvUser (see page 52) object that contains an information about a user indicated by Id.

4.2.1.1.1.4.6 Nffv.Verify Method

Compares a captured fingerprint with the one that was enrolled to a database before in order to determine whether two match.

C#

```
public int Verify(NffvUser user, uint timeout, out NffvStatus status);
```

Parameters

Parameters	Description
NffvUser user	A reference to a database record that should be matched with the scanned fingerprint.
uint timeout	Specifies the time in milliseconds after which the fingerprint scanner stops scanning fingerprint. This usually happens when a finger is removed from a scanner for longer than *timeout* milliseconds.

out NffvStatus status	The verification status value indicated by one of the value enumerated in NffvStatus (see page 53).

Returns

This function returns a matching score.

Example

This C# sample code demonstrates how to verify two fingerprints.

```
Nffv engine;

//An internal class that saves the verification result
internal class VerificationResult
{
    public NffvStatus engineStatus;
    public int score;
};

public void doVerify(object sender, DoWorkEventArgs args)
{
    VerificationResult verificationResult = new VerificationResult();
    verificationResult.score = engine.Verify((NffvUser)args.Argument, 20000, out
verificationResult.engineStatus);
    args.Result = verificationResult;
}
```

Note that it isn't a complete code that can be used in your application.

For a complete code see the C# Sample application.

4.2.1.1.1.5 Nffv Properties

4.2.1.1.1.5.1 Nffv.MatchingThreshold Property

Gets or sets the minimum similarity value that verification method uses to determine whether the fingerprint matches.

C#

```
public int MatchingThreshold;
```

Property value

The minimum similarity value that verification function accept for the same finger fingerprints. The default value is 0.01 %.

4.2.1.1.1.5.2 Nffv.QualityThreshold Property

Gets or sets image quality threshold.

C#

```
public byte QualityThreshold;
```

Property value

The fingerprint quality threshold. The value should be in range [0, 255]. The default value is 100.

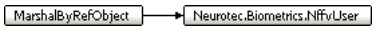
4.2.1.1.2 NffvUser Class

Provides methods and properties for working with users.

C#

```
public sealed class NffvUser : MarshalByRefObject;
```

Class Hierarchy



NffvUser Methods

	Name	Description
	GetBitmap (see page 53)	Returns the bitmap of the last scanned fingerprint.
	GetHBitmap (see page 53)	Returns a handle to the bitmap of the last scanned fingerprint.

4.2.1.1.2.1 NffvUser Methods

4.2.1.1.2.1.1 NffvUser.GetBitmap Method

Returns the bitmap of the last scanned fingerprint.

C#

```
public Bitmap GetBitmap();
```

Returns

A Bitmap object.

4.2.1.1.2.1.2 NffvUser.GetHBitmap Method

Returns a handle to the bitmap of the last scanned fingerprint.

C#

```
public IntPtr GetHBitmap();
```

Returns

A pointer to Bitmap object.

4.2.1.2 Structs, Records, Enums

The following table lists structs, records, enums in this documentation.

Enumerations

	Name	Description
	NffvStatus (see page 53)	Enumerates enrollment or verification status values.

4.2.1.2.1 Neurotec.Biometrics.NffvStatus Enumeration

Enumerates enrollment or verification status values.

C#

```
[Serializable]
public enum NffvStatus {
  None = 0,
  TemplateCreated = 1,
  NoScanner = 2,
  ScannerTimeout = 3,
  UserCanceled = 4,
  QualityCheckFailed = 100
}
```

Members

Members	Description
TemplateCreated = 1	Indicates that the fingerprint template was created.
NoScanner = 2	Indicates that there is no fingerprint scanner connected.
ScannerTimeout = 3	Indicates that the fingerprint scanner has reached the timeout.

UserCanceled = 4	Indicates that a user has canceled a fingerprint scanning.
QualityCheckFailed = 100	Indicates that the Free Fingerprint Verification SDK had failed to check the quality of a fingerprint.

4.3 Java Reference

This chapter provides the Free Fingerprint Verification SDK programming reference for Java programming language.

Notes

You can find source files of the Java wrapper under the FFV SDK directory *\samples\Java\NffvJavaWrapper\src\com\neurotechnology*.

Packages

Name	Description
com.neurotechnology.Library (see page 54)	Classes under this namespace provides methods for working with com.neurotechnology.Nffv (see page 63) library.
com.neurotechnology.Nffv (see page 63)	Classes under this namespace provides methods for the com.neurotechnology.Nffv (see page 64) library.

4.3.1 com.neurotechnology.Library Package

Classes under this namespace provides methods for working with com.neurotechnology.Nffv (see page 63) library.

Module

Java Reference (see page 54)

Classes

	Name	Description
	LibraryInfo (see page 55)	Provides methods for getting a library information.
	NativeManager (see page 57)	This class is responsible for loading Neurotechnology modules and native library that contains implementation of native methods in JavaWrapper classes.
	NativeObject (see page 59)	Provides methods for working with native objects.
	NetInstall (see page 59)	NetInstall class manages installation of Neurotechnogy modules for Applet applications. Since com.neurotechnology.Nffv (see page 63) classes are using native libraries these libraries need to be accessible for application that are using classes from com.neurotechnology.Nffv (see page 63). This class parses files that consist list of libraries needed and allows download them to predefined location.
	ScannerFiles (see page 61)	Provides methods for managing scanner files.
	TemplateFileFilter (see page 62)	Extends Java's FileFilter interface. Provides methods for filtering files.

4.3.1.1 Classes

The following table lists classes in this documentation.

Classes

	Name	Description
	LibraryInfo (see page 55)	Provides methods for getting a library information.

	NativeManager (see page 57)	This class is responsible for loading Neurotechnology modules and native library that contains implementation of native methods in JavaWrapper classes.
	NativeObject (see page 59)	Provides methods for working with native objects.
	NetInstall (see page 59)	NetInstall class manages installation of Neurotechnogy modules for Applet applications. Since com.neurotechnology.Nffv (see page 63) classes are using native libraries these libraries need to be accessible for application that are using classes from com.neurotechnology.Nffv (see page 63). This class parses files that consist list of libraries needed and allows download them to predefined location.
	ScannerFiles (see page 61)	Provides methods for managing scanner files.
	TemplateFileFilter (see page 62)	Extends Java's FileFilter interface. Provides methods for filtering files.

4.3.1.1.1 LibraryInfo Class

Provides methods for getting a library information.

Java

```
public class LibraryInfo;
```

Class Hierarchy

com.neurotechnology.Library.LibraryInfo

LibraryInfo Methods

	Name	Description
	getCompany (see page 55)	Gets a company name.
	getCopyright (see page 55)	Gets a copyright notice from the library.
	getProduct (see page 56)	Gets product name.
	getTitle (see page 56)	Gets a title form the library.
	getVersionBuild (see page 56)	Gets library build version.
	getVersionMajor (see page 56)	Gets library's major version.
	getVersionMinor (see page 56)	Gets library's minor version.
	getVersionRevision (see page 56)	Gets library's revision version.

4.3.1.1.1.1 LibraryInfo Methods

4.3.1.1.1.1.1 LibraryInfo.getCompany Method

Gets a company name.

Java

```
public String getCompany();
```

Returns

A string that contains a company name.

4.3.1.1.1.1.2 LibraryInfo.getCopyright Method

Gets a copyright notice from the library.

Java

```
public String getCopyright();
```

Returns

A string that contains library's copyright notice.

4.3.1.1.1.1.3 LibraryInfo.getProduct Method

Gets product name.

Java

```
public String getProduct();
```

Returns

A string that contains product name.

4.3.1.1.1.1.4 LibraryInfo.getTitle Method

Gets a title form the library.

Java

```
public String getTitle();
```

Returns

A string that contains library title.

4.3.1.1.1.1.5 LibraryInfo.getVersionBuild Method

Gets library build version.

Java

```
public int getVersionBuild();
```

Returns

Library's build version number.

4.3.1.1.1.1.6 LibraryInfo.getVersionMajor Method

Gets library's major version.

Java

```
public int getVersionMajor();
```

Returns

Major version of a library..

4.3.1.1.1.1.7 LibraryInfo.getVersionMinor Method

Gets library's minor version.

Java

```
public int getVersionMinor();
```

Returns

Library's minor version number.

4.3.1.1.1.1.8 LibraryInfo.getVersionRevision Method

Gets library's revision version.

Java

```
public int getVersionRevision();
```

Returns

Library's revision version number.

4.3.1.1.2 NativeManager Class

This class is responsible for loading Neurotechnology modules and native library that contains implementation of native methods in JavaWrapper classes.

Java

```
public class NativeManager;
```

Class Hierarchy

com.neurotechnology.Library.NativeManager

NativeManager Fields

	Name	Description
	defaultlibrary (see page 57)	Default name of a library.
	isLibraryLoaded (see page 57)	A boolean value indicating if a library was loaded.

NativeManager Methods

	Name	Description
	getProductName (see page 57)	Gets a product name. If a library fails to load an exception is thrown.
	getVersionMajor (see page 58)	Gets a major version of a library. If a library fails to load an exception is thrown.
	getVersionMinor (see page 58)	Gets a minor version of a library. If a library fails to load an exception is thrown.
	getWrapperLibraryInfo (see page 58)	Gets information (such as company name, product, copyright notice) about wrapper's library.
	isLoaded (see page 58)	Checks if a library was loaded to memory.
	loadDefault (see page 58)	Loads a default library.
	loadFile (see page 58)	Loads default and Java native libraries.

4.3.1.1.2.1 NativeManager Fields

4.3.1.1.2.1.1 NativeManager.defaultlibrary Field

Default name of a library.

Java

```
public static String defaultlibrary = "NeurotecJavaNative";
```

4.3.1.1.2.1.2 NativeManager.isLibraryLoaded Field

A boolean value indicating if a library was loaded.

Java

```
protected static boolean isLibraryLoaded;
```

4.3.1.1.2.2 NativeManager Methods

4.3.1.1.2.2.1 NativeManager.getProductName Method

Gets a product name. If a library fails to load an exception is thrown.

Java

```
public static String getProductName() throws Exception;
```

Returns

String that contains a product name.

4.3.1.1.2.2.2 NativeManager.getVersionMajor Method

Gets a major version of a library. If a library fails to load an exception is thrown.

Java

```
public static int getVersionMajor() throws Exception;
```

Returns

Integer value of library version.

4.3.1.1.2.2.3 NativeManager.getVersionMinor Method

Gets a minor version of a library. If a library fails to load an exception is thrown.

Java

```
public static int getVersionMinor() throws Exception;
```

Returns

Integer value of library minor version.

4.3.1.1.2.2.4 NativeManager.getWrapperLibraryInfo Method

Gets information (such as company name, product, copyright notice) about wrapper's library.

Java

```
public static LibraryInfo getWrapperLibraryInfo();
```

Returns

LibraryInfo (see page 55) object that information about wrapper.

4.3.1.1.2.2.5 NativeManager.isLoaded Method

Checks if a library was loaded to memory.

Java

```
public static boolean isLoaded();
```

Returns

Boolean value indicating if a library was loaded to memory.

4.3.1.1.2.2.6 NativeManager.loadDefault Method

Loads a default library.

Java

```
public static void loadDefault();
```

4.3.1.1.2.2.7 NativeManager.loadFile Method

Loads default and Java native libraries.

Java

```
public static void loadFile(String neuratecjavanative, String nlicensing);
```

Parameters

Parameters	Description
String nlicensing	Name of the Neurotechnology's NLicensing library.
neurotecjavanative	Name of a Java native library.

4.3.1.1.3 NativeObject Class

Provides methods for working with native objects.

Java

```
public class NativeObject extends Object;
```

Class Hierarchy

Methods

	Name	Description
	NativeObject (see page 59)	Creates a new instance of the NativeObject.

NativeObject Methods

	Name	Description
	getHandle (see page 59)	Gets a handle of the NativeObject.
	setHandle (see page 59)	Sets a handle for the NativeObject.

4.3.1.1.3.1 NativeObject.NativeObject Constructor

Creates a new instance of the NativeObject.

Java

```
public NativeObject();
```

4.3.1.1.3.2 NativeObject Methods

4.3.1.1.3.2.1 NativeObject.getHandle Method

Gets a handle of the NativeObject (see page 59).

Java

```
public long getHandle();
```

Returns

Handle to the NativeObject (see page 59).

4.3.1.1.3.2.2 NativeObject.setHandle Method

Sets a handle for the NativeObject (see page 59).

Java

```
public void setHandle(long handle);
```

Parameters

Parameters	Description
long handle	Handle for the NativeObject (see page 59).

4.3.1.1.4 NetInstall Class

NetInstall class manages installation of Neurotechnogy modules for Applet applications. Since com.neurotechnology.Nffv (see page 63) classes are using native libraries these libraries need to be accessible for application that are using classes from com.neurotechnology.Nffv (see page 63). This class parses files that consist list of libraries needed and allows download them to predefined location.

Java

```
public class NetInstall;
```

Class Hierarchy

com.neurotechnology.Library.NetInstall

Methods

	Name	Description
	NetInstall (see page 60)	Creates a new instance of the NetInstall.

NetInstall Methods

	Name	Description
	checkLoadDefault (see page 60)	Tries to load libraries by default load method. Search is done in system path and user path variables. If Libraries are found they are loaded and checkLoadDefault returns true. Overwise it returns false.
	checkLoadTemp (see page 60)	Tries to load libraries from temporary folder that is located in /.neurotec/.If load is successful returns true and false overwise.
	getEnvironment (see page 60)	Gets an environment properties.
	getMainLibrariesLinux (see page 61)	Retrieves an array of objects (vector) of libraries for fingerprint scanners. This method returns libraries for Linux.
	getMainLibrariesWindows (see page 61)	Retrieves an array of objects (vector) of libraries for Windows OS. These libraries are used by the FFV SDK.
	getScannerLibrariesWindows (see page 61)	Retrieves an array of objects (vector) of libraries for fingerprint scanners.
	installTemp (see page 61)	Installs Neurotec libraries to temporary directory /.neurotec/

4.3.1.1.4.1 NetInstall.NetInstall Constructor

Creates a new instance of the NetInstall.

Java

```
public NetInstall() throws Exception;
```

4.3.1.1.4.2 NetInstall Methods

4.3.1.1.4.2.1 NetInstall.checkLoadDefault Method

Tries to load libraries by default load method. Search is done in system path and user path variables. If Libraries are found they are loaded and checkLoadDefault returns true. Overwise it returns false.

Java

```
public static boolean checkLoadDefault();
```

Returns

Boolean value indicating if the default FFV SDK library was loaded.

4.3.1.1.4.2.2 NetInstall.checkLoadTemp Method

Tries to load libraries from temporary folder that is located in /.neurotec/.If load is successful returns true and false overwise.

Java

```
public boolean checkLoadTemp();
```

4.3.1.1.4.2.3 NetInstall.getEnvironment Method

Gets an environment properties.

Java

```
public Properties getEnvironment() throws java.io.IOException;
```

Returns

Property list that contains environment data.

4.3.1.1.4.2.4 NetInstall.getMainLibrariesLinux Method

Retrieves an array of objects (vector) of libraries for fingerprint scanners. This method returns libraries for Linux.

Java

```
public Vector<String> getMainLibrariesLinux() throws Exception;
```

Returns

Array of objects (vector) that contains strings of libraries for the Linux.

4.3.1.1.4.2.5 NetInstall.getMainLibrariesWindows Method

Retrieves an array of objects (vector) of libraries for Windows OS. These libraries are used by the FFV SDK.

Java

```
public Vector<String> getMainLibrariesWindows() throws Exception;
```

Returns

Array of objects (vector) that contains strings of libraries for the Windows.

4.3.1.1.4.2.6 NetInstall.getScannerLibrariesWindows Method

Retrieves an array of objects (vector) of libraries for fingerprint scanners.

Java

```
public Vector<ScannerFiles> getScannerLibrariesWindows() throws Exception;
```

Returns

Array of objects (vector) that contains fingerprint scanners names.

4.3.1.1.4.2.7 NetInstall.installTemp Method

Installs Neurotec libraries to temporary directory /.neurotec/

Java

```
public void installTemp(String codeBase, Vector<String> mainlibs, Vector<ScannerFiles>
scanners);
```

4.3.1.1.5 ScannerFiles Class

Provides methods for managing scanner files.

Java

```
public class ScannerFiles;
```

Class Hierarchy

com.neurotechnology.Library.ScannerFiles

Methods

	Name	Description
	ScannerFiles (see page 62)	Creates a new instance of the ScannerFiles.

ScannerFiles Methods

	Name	Description
	getFiles (see page 62)	Returns an array of objects (vector) that contains names of all fingerprint scanners files.
	getName (see page 62)	Gets a name of a fingerprint scanner.

4.3.1.1.5.1 ScannerFiles.ScannerFiles Constructor

Creates a new instance of the ScannerFiles.

Java

```
protected ScannerFiles();
```

4.3.1.1.5.2 ScannerFiles Methods

4.3.1.1.5.2.1 ScannerFiles.getFiles Method

Returns an array of objects (vector) that contains names of all fingerprint scanners files.

Java

```
public Vector<String> getFiles();
```

Returns

Vector that contains files names.

4.3.1.1.5.2.2 ScannerFiles.getName Method

Gets a name of a fingerprint scanner.

Java

```
public String getName();
```

Returns

String that contains a name of fingerprint scanner.

4.3.1.1.6 TemplateFileFilter Class

Extends Java's FileFilter interface. Provides methods for filtering files.

Java

```
public class TemplateFileFilter extends FileFilter;
```

Class Hierarchy

TemplateFileFilter Methods

	Name	Description
	accept (see page 62)	Tests whether or not the specified file should be included in a file list.
	getDescription (see page 63)	Gets a description of template files.
	getFileExtension (see page 63)	Gets the extension of a file.

4.3.1.1.6.1 TemplateFileFilter Methods

4.3.1.1.6.1.1 TemplateFileFilter.accept Method

Tests whether or not the specified file should be included in a file list.

Java

```
public boolean accept(File f);
```

Parameters

Parameters	Description
File f	Path to a file that should be tested.

Returns

Boolean value that indicates if file should be be included. File is included when a return value is true.

4.3.1.1.6.1.2 TemplateFileFilter.getDescription Method

Gets a description of template files.

Java

```
public String getDescription();
```

Returns

String that contains template files description.

4.3.1.1.6.1.3 TemplateFileFilter.getFileExtension Method

Gets the extension of a file.

Java

```
public static String getFileExtension(File f);
```

Parameters

Parameters	Description
File f	Path to a file which extension should be returned.

Returns

String that contains file extension.

4.3.2 com.neurotechnology.Nffv Package

Classes under this namespace provides methods for the com.neurotechnology.Nffv (see page 64) library.

Module

Java Reference (see page 54)

Classes

	Name	Description
	Nffv (see page 64)	The main class of the Free Fingerprint Verification SDK. Provides methods and properties for working with users list and enrolling or verifying user fingerprints.
	NffvImage (see page 68)	Provides methods for managing images.
	NffvUser (see page 71)	Provides methods for working with users.
	ScannerModule (see page 72)	Provides methods for setting and getting scanner names from the ScannerModule.

4.3.2.1 Classes

The following table lists classes in this documentation.

Classes

	Name	Description
	Nffv (see page 64)	The main class of the Free Fingerprint Verification SDK. Provides methods and properties for working with users list and enrolling or verifying user fingerprints.
	NffvImage (see page 68)	Provides methods for managing images.
	NffvUser (see page 71)	Provides methods for working with users.
	ScannerModule (see page 72)	Provides methods for setting and getting scanner names from the ScannerModule.

4.3.2.1.1 Nffv Class

The main class of the Free Fingerprint Verification SDK. Provides methods and properties for working with users list and enrolling or verifying user fingerprints.

Java

```
public class Nffv;
```

Class Hierarchy

com.neurotechnology.Nffv.Nffv

Methods

	Name	Description
	Nffv (see page 64)	Creates a new instance of the Nffv.

Nffv Methods

	Name	Description
	clearUsers (see page 65)	Removes all users from a database.
	contains (see page 65)	Checks if the database contains a concrete user.
	enroll (see page 65)	Gets a fingerprint from a scanner and saves it to a database.
	finalize (see page 65)	Implements standard Java method used by the garbage collector.
	getAvailableScannerModules (see page 65)	Returns available fingerprint scanner modules for usage in the Free Fingerprint Verification SDK.
	getEngineStatus (see page 66)	Gets status information of the com.neurotechnology.Nffv (see page 63).
	getMatchingThreshold (see page 66)	Gets the minimum similarity value that verification function uses to determine whether the fingerprint matches.
	getMaxUserCount (see page 66)	The maximum number of users that can be enrolled to a database.
	getQualityThreshold (see page 66)	Gets image quality threshold.
	getUserByID (see page 66)	Returns a user details by the Id.
	getUsers (see page 67)	Gets a list of users enrolled to a database.
	removeUser (see page 67)	Removes a concrete user from a database.
	removeUserID (see page 67)	Removes user's ID.
	setMatchingThreshold (see page 67)	Sets the minimum similarity value that verification function uses to determine whether the fingerprint matches.
	setQualityThreshold (see page 67)	Sets image quality threshold.
	verify (see page 67)	Compares a captured fingerprint with the one that was enrolled to a database before in order to determine whether two match.

4.3.2.1.1.1 Nffv.Nffv Constructor

Creates a new instance of the Nffv.

Java

```
public Nffv(String database, String password, ScannerModule[] scannerModules);
```

Parameters

Parameters	Description
String database	Name of a database,
String password	Password for a database.
ScannerModule[] scannerModules	List of scanner modules that should be loaded.

4.3.2.1.1.2 Nffv Methods

4.3.2.1.1.2.1 Nffv.clearUsers Method

Removes all users from a database.

Java

```
public void clearUsers();
```

4.3.2.1.1.2.2 Nffv.contains Method

Checks if the database contains a concrete user.

Java

```
public boolean contains(NffvUser user);
```

Parameters

Parameters	Description
NffvUser user	User details to check.

Returns

Boolean value indicating if a database contains a concrete user.

4.3.2.1.1.2.3 Nffv.enroll Method

Gets a fingerprint from a scanner and saves it to a database.

Java

```
public NffvUser enroll(int timeout);
```

Parameters

Parameters	Description
int timeout	Specifies the time in milliseconds after which the fingerprint scanner stops scanning fingerprint. This usually happens when a finger is removed from a scanner for longer than timeout milliseconds.

Returns

NffvUser (see page 71) object that contains (see page 65) details of an enrolled user.

4.3.2.1.1.2.4 Nffv.finalize Method

Implements standard Java method used by the garbage collector.

Java

```
public void finalize() throws Throwable;
```

4.3.2.1.1.2.5 Nffv.getAvailableScannerModules Method

Returns available fingerprint scanner modules for usage in the Free Fingerprint Verification SDK.

Java

```
public static ScannerModule getAvailableScannerModules();
```

Returns

Array that contains (see page 65) available scanner modules.

4.3.2.1.1.2.6 Nffv.getEngineStatus Method

Gets status information of the com.neurotechnology.Nffv (see page 63).

Java

```
public NffvStatus getEngineStatus();
```

Returns

NffvStatus (see page 43) object that holds information about Nffv (see page 64).

4.3.2.1.1.2.7 Nffv.getMatchingThreshold Method

Gets the minimum similarity value that verification function uses to determine whether the fingerprint matches.

Java

```
public int getMatchingThreshold();
```

Returns

The minimum similarity value that verification function accept for the same finger fingerprints. The default value is 0.01 %.

4.3.2.1.1.2.8 Nffv.getMaxUserCount Method

The maximum number of users that can be enrolled to a database.

Java

```
public static native int getMaxUserCount();
```

Returns

The maximum number of users that can be enrolled to a database.

4.3.2.1.1.2.9 Nffv.getQualityThreshold Method

Gets image quality threshold.

Java

```
public int getQualityThreshold();
```

Returns

Returns fingerprint quality threshold. The value should be in range [0, 255]. The default value is 100.

4.3.2.1.1.2.10 Nffv.getUserByID Method

Returns a user details by the Id.

Java

```
public NffvUser getUserByID(int id);
```

Parameters

Parameters	Description
int id	User Id.

Returns

NffvUser (see page 71) object that contains (see page 65) user details.

4.3.2.1.1.2.11 Nffv.getUsers Method

Gets a list of users enrolled to a database.

Java

```
public List<NffvUser> getUsers();
```

Returns

List of users that was enrolled to a database.

4.3.2.1.1.2.12 Nffv.removeUser Method

Removes a concrete user from a database.

Java

```
public void removeUser(NffvUser user) throws Exception;
```

Parameters

Parameters	Description
NffvUser user	NffvUser (see page 71) object that should be removed.

4.3.2.1.1.2.13 Nffv.removeUserID Method

Removes user's ID.

Java

```
public void removeUserID(int ID);
```

Parameters

Parameters	Description
int ID	User's ID to remove.

4.3.2.1.1.2.14 Nffv.setMatchingThreshold Method

Sets the minimum similarity value that verification function uses to determine whether the fingerprint matches.

Java

```
public void setMatchingThreshold(int value);
```

Parameters

Parameters	Description
int value	The minimum similarity value that verification function accept for the same finger fingerprints.

4.3.2.1.1.2.15 Nffv.setQualityThreshold Method

Sets image quality threshold.

Java

```
public void setQualityThreshold(int value);
```

Parameters

Parameters	Description
Image	quality threshold to set.

4.3.2.1.1.2.16 Nffv.verify Method

Compares a captured fingerprint with the one that was enrolled to a database before in order to determine whether two match.

Java

```
public int verify(NffvUser user, int timeout);
```

Parameters

Parameters	Description
NffvUser user	A reference to a database record that should be matched with the scanned fingerprint.
int timeout	Specifies the time in milliseconds after which the fingerprint scanner stops scanning fingerprint. This usually happens when a finger is removed from a scanner for longer than timeout milliseconds.

Returns

Matching score.

4.3.2.1.1.3 NffvStatus

Enumerates enrollment status values.

Java

```
public enum NffvStatus {
    None,
    // Indicates that a fingerprint template was created.
    TemplateCreated,
    // Indicates that there is no fingerprint scanner connected.
    NoScanner,
    // Indicates that the fingerprint scanner has reached the timeout.
    ScannerTimeout,
    // Indicates that the Free Fingerprint Verification SDK had failed to check the quality
of a fingerprint.
    QualityCheckFailed;
```

4.3.2.1.2 NffvImage Class

Provides methods for managing images.

Java

```
public class NffvImage;
```

Class Hierarchy

com.neurotechnology.Nffv.NffvImage

NffvImage Methods

	Name	Description
	getBufferedImage (see page 69)	Gets a buffered image.
	getHeight (see page 69)	Retrieves image height.
	getHorizontalResolution (see page 69)	Gets the horizontal resolution of the image.
	getImageData (see page 69)	Gets an image data as a byte array.
	getImageIcon (see page 69)	Get an image icon.
	getStride (see page 70)	Gets the stride (size of one row) of the image.
	getVerticalResolution (see page 70)	Retrieves the vertical resolution of the image.
	getWidth (see page 70)	Retrieves image width.
	setHeight (see page 70)	Sets image height.
	setHorizontalResolution (see page 70)	Sets the horizontal resolution of the image.

	setImageData (see page 70)	Creates an image from a byte array.
	setStride (see page 71)	Sets the stride (size of one row) of the image.
	setVerticalResolution (see page 71)	Sets the vertical resolution of the image.
	setWidth (see page 71)	Sets image width.

4.3.2.1.2.1 NffvImage Methods

4.3.2.1.2.1.1 NffvImage.getBufferedImage Method

Gets a buffered image.

Java

```
public BufferedImage getBufferedImage();
```

Returns

Buffered image which contains an accessible buffer of the image.

4.3.2.1.2.1.2 NffvImage.getHeight Method

Retrieves image height.

Java

```
public int getHeight();
```

Returns

Image height in pixels.

4.3.2.1.2.1.3 NffvImage.getHorizontalResolution Method

Gets the horizontal resolution of the image.

Java

```
public float getHorizontalResolution();
```

Returns

Horizontal resolution of image.

4.3.2.1.2.1.4 NffvImage.getImageData Method

Gets an image data as a byte array.

Java

```
public byte getImageData();
```

Returns

Byte array that contains image data.

4.3.2.1.2.1.5 NffvImage.getImageIcon Method

Get an image icon.

Java

```
public ImageIcon getImageIcon();
```

Returns

An icon of the image.

4.3.2.1.2.1.6 NffvImage.getStride Method

Gets the stride (size of one row) of the image.

Java

```
public int getStride();
```

Returns

Image stride.

4.3.2.1.2.1.7 NffvImage.getVerticalResolution Method

Retrieves the vertical resolution of the image.

Java

```
public float getVerticalResolution();
```

Returns

Vertical resolution of image.

4.3.2.1.2.1.8 NffvImage.getWidth Method

Retrieves image width.

Java

```
public int getWidth();
```

Returns

Image width in pixels.

4.3.2.1.2.1.9 NffvImage.setHeight Method

Sets image height.

Java

```
public void setHeight(int height);
```

Parameters

Parameters	Description
int height	Image height in pixels.

4.3.2.1.2.1.10 NffvImage.setHorizontalResolution Method

Sets the horizontal resolution of the image.

Java

```
public void setHorizontalResolution(float horizontalResolution);
```

Parameters

Parameters	Description
float horizontalResolution	Horizontal resolution of image to set.

4.3.2.1.2.1.11 NffvImage.setImageData Method

Creates an image from a byte array.

Java

```
public void setImageData(byte [] imageData);
```

Parameters

Parameters	Description
byte [] imageData	Byte array that contains image data.

4.3.2.1.2.1.12 NffvImage.setStride Method

Sets the stride (size of one row) of the image.

Java

```
public void setStride(int stride);
```

Parameters

Parameters	Description
int stride	Image stride.

4.3.2.1.2.1.13 NffvImage.setVerticalResolution Method

Sets the vertical resolution of the image.

Java

```
public void setVerticalResolution(float verticalResolution);
```

Parameters

Parameters	Description
float verticalResolution	Vertical resolution of image to set.

4.3.2.1.2.1.14 NffvImage.setWidth Method

Sets image width.

Java

```
public void setWidth(int width);
```

Parameters

Parameters	Description
int width	Image width in pixels.

4.3.2.1.3 NffvUser Class

Provides methods for working with users.

Java

```
public class NffvUser extends NativeObject;
```

Class Hierarchy

NffvUser Methods

	Name	Description
	getID (see page 72)	Retrieves from a database user's ID. If a user was disposed or removed from engine an error is thrown.
	getNffvImage (see page 72)	Gets tan Image from the com.neurotechnology.Nffv (see page 63).
	toString (see page 72)	Gets a string representation of object.

4.3.2.1.3.1 NffvUser Methods

4.3.2.1.3.1.1 NffvUser.getID Method

Retrieves from a database user's ID. If a user was disposed or removed from engine an error is thrown.

Java

```
public int getID() throws Exception;
```

Returns

User's ID.

4.3.2.1.3.1.2 NffvUser.getNffvImage Method

Gets tan Image from the com.neurotechnology.Nffv (see page 63).

Java

```
public NffvImage getNffvImage() throws Exception;
```

Returns

NffvImage (see page 68) object.

4.3.2.1.3.1.3 NffvUser.toString Method

Gets a string representation of object.

Java

```
public String toString();
```

Returns

String representation of object.

4.3.2.1.4 ScannerModule Class

Provides methods for setting and getting scanner names from the ScannerModule.

Java

```
public class ScannerModule;
```

Class Hierarchy

com.neurotechnology.Nffv.ScannerModule

Methods

	Name	Description
	ScannerModule (see page 72)	Creates a new instance of the ScannerModule

ScannerModule Methods

	Name	Description
	getName (see page 73)	Gets a fingerprint scanner name.

4.3.2.1.4.1 ScannerModule.ScannerModule Constructor

Creates a new instance of the ScannerModule

Java

```
protected ScannerModule(String name);
```

Parameters

Parameters	Description
String name	A name of a scanner to set.

4.3.2.1.4.2 ScannerModule Methods

4.3.2.1.4.2.1 ScannerModule.getName Method

Gets a fingerprint scanner name.

Java

```
public String getName();
```

Returns

String that contains fingerprint scanner name.

4.4 Delphi Reference

This chapter provides the Free Fingerprint Verification SDK programming reference for Delphi programming language.

Notes

These files under directory *\samples\Delphi* are used for building Delphi wrapper of the FFV SDK:

- Nffv.pas
- NffvUser.pas

Also you can read Delphi sample (see page 21) chapter for more information.

Namespaces

Name	Description
Nffv (see page 73)	Contains classes and methods that provide the Free Fingerprint Verification SDK functionality.
NffvUser (see page 80)	Provides methods and properties for working with users.

4.4.1 Nffv Namespace

Contains classes and methods that provide the Free Fingerprint Verification SDK functionality.

Module

Delphi Reference (see page 73)

Classes

	Name	Description
	TNffv (see page 74)	The main class of the Free Fingerprint Verification SDK. Provides methods and properties for working with users and fingerprints.

Constants

Name	Description
dllName (see page 80)	Name of the dll that provides the main functionality of the FFV SDK.

Functions

	Name	Description
	EngineStatusString (see page 78)	Gets a string message that hold information about TNffv (see page 74) status.

	GetAvailableScannerModules (see page 79)	Returns available fingerprint scanner modules for usage in the Free Fingerprint Verification SDK.
	NffvFreeMemory (see page 79)	Releases memory allocated by the GetAvailableScannerModules (see page 79) function.
	NffvGetInfo (see page 79)	Gets information about the Nffv library.

Structs, Records, Enums

	Name	Description
	TNffvStatus (see page 79)	Enumerates enrollment or verification status values.

4.4.1.1 Classes

The following table lists classes in this documentation.

Classes

	Name	Description
	TNffv (see page 74)	The main class of the Free Fingerprint Verification SDK. Provides methods and properties for working with users and fingerprints.

4.4.1.1.1 TNffv Class

The main class of the Free Fingerprint Verification SDK. Provides methods and properties for working with users and fingerprints.

Pascal

```
TNffv = class;
```

Class Hierarchy

Methods

	Name	Description
	Create (see page 75)	Creates a new instance of the TNffv.
V	Destroy (see page 75)	Releases resources used by object.

TNffv Methods

	Name	Description
	Cancel (see page 75)	Cancels a fingerprint enrollment or verification operation.
	Enroll (see page 75)	Gets a fingerprint from a scanner and saves it to a database.
	GetMatchingThreshold (see page 76)	Gets the minimum similarity value that verification function uses to determine whether the fingerprint matches.
	GetQualityThreshold (see page 76)	Gets image quality threshold.
	GetUserById (see page 76)	Returns a user details by Id.
	GetUserByIndex (see page 76)	Returns a user details by the index.
	GetUserCount (see page 77)	Gets the number of users that the Nffv (see page 73) contains.
	GetUserIndexById (see page 77)	Returns an index of the user specified by Id.
	RemoveUser (see page 77)	Removes a user specified by an index from a database.
	RemoveUsers (see page 77)	Removes all users from a database.
	SetMatchingThreshold (see page 77)	Sets the minimum similarity value that verification function uses to determine whether the fingerprint matches.
	SetQualityThreshold (see page 77)	Sets image quality threshold.

	Verify (see page 78)	Compares a captured fingerprint with the one that was enrolled to a database before in order to determine whether two match.

4.4.1.1.1.1 Create Constructor

4.4.1.1.1.1.1 TNffv.Create Constructor (string, string)

Creates a new instance of the TNffv (see page 74).

Pascal

```
constructor Create(databaseName: string; password: string); overload;
```

Parameters

Parameters	Description
databaseName: string	Database name. This database is used for storing user details and fingerprints.
password: string	Password for database.

4.4.1.1.1.1.2 TNffv.Create Constructor (string, string, string)

Creates a new instance of the TNffv (see page 74).

Pascal

```
constructor Create(databaseName: string; password: string; scannerModules: string);
overload;
```

Parameters

Parameters	Description
databaseName: string	Database name. This database is used for storing user details and fingerprints.
password: string	Password for database.
scannerModules: string	String that contains a list of scanners to load.

4.4.1.1.1.2 TNffv.Destroy Destructor

Releases resources used by object.

Pascal

```
destructor Destroy; override;
```

4.4.1.1.1.3 TNffv Methods

4.4.1.1.1.3.1 TNffv.Cancel Method

Cancels a fingerprint enrollment or verification operation.

Pascal

```
procedure Cancel;
```

Remarks

This method is useful when the fingerprint enrollment or verification operation take too long. In this case a message box can be shown for a user to cancel this operation.

4.4.1.1.1.3.2 TNffv.Enroll Method

Gets a fingerprint from a scanner and saves it to a database.

Pascal

```
function Enroll(timeout: LongWord; var engineStatus: TNffvStatus): TNffvUser;
```

Parameters

Parameters	Description
timeout: LongWord	Specifies the time in milliseconds after which the fingerprint scanner stops scanning fingerprint. This usually happens when a finger is removed from a scanner for longer than timeout milliseconds.
var engineStatus: TNffvStatus	The enrollment status value.

Returns

A reference to TNffvUser (see page 80) object which provides methods for managing enrolled users.

4.4.1.1.1.3.3 TNffv.GetMatchingThreshold Method

Gets the minimum similarity value that verification function uses to determine whether the fingerprint matches.

Pascal

```
function GetMatchingThreshold: LongInt;
```

Returns

The minimum similarity value that verification function accept for the same finger fingerprints. The default value is 0.01 %.

4.4.1.1.1.3.4 TNffv.GetQualityThreshold Method

Gets image quality threshold.

Pascal

```
function GetQualityThreshold: Byte;
```

Returns

The fingerprint quality threshold. The value should be in range [0, 255]. The default value is 100.

4.4.1.1.1.3.5 TNffv.GetUserById Method

Returns a user details by Id.

Pascal

```
function GetUserById(id: LongInt): TNffvUser;
```

Parameters

Parameters	Description
id: LongInt	User's identification number.

Returns

A reference to TNffvUser (see page 80) object which provides methods for managing enrolled users.

4.4.1.1.1.3.6 TNffv.GetUserByIndex Method

Returns a user details by the index.

Pascal

```
function GetUserByIndex(index: LongInt): TNffvUser;
```

Parameters

Parameters	Description
index: LongInt	User's index.

Returns

A reference to TNffvUser (see page 80) object which provides methods for managing enrolled users.

4.4.1.1.1.3.7 TNffv.GetUserCount Method

Gets the number of users that the Nffv (see page 73) contains.

Pascal

```
function GetUserCount: LongInt;
```

Returns

The number of users in the Nffv (see page 73).

4.4.1.1.1.3.8 TNffv.GetUserIndexById Method

Returns an index of the user specified by Id.

Pascal

```
function GetUserIndexById(id: LongInt): LongInt;
```

Parameters

Parameters	Description
id: LongInt	User's ID.

Returns

Index of the user specified by Id.

4.4.1.1.1.3.9 TNffv.RemoveUser Method

Removes a user specified by an index from a database.

Pascal

```
procedure RemoveUser(index: LongInt);
```

Parameters

Parameters	Description
index: LongInt	User's index.

4.4.1.1.1.3.10 TNffv.RemoveUsers Method

Removes all users from a database.

Pascal

```
procedure RemoveUsers;
```

4.4.1.1.1.3.11 TNffv.SetMatchingThreshold Method

Sets the minimum similarity value that verification function uses to determine whether the fingerprint matches.

Pascal

```
procedure SetMatchingThreshold(threshold: LongInt);
```

Parameters

Parameters	Description
threshold: LongInt	The minimum similarity value that verification function accept for the same finger fingerprints. The default value is 0.01 %.

4.4.1.1.1.3.12 TNffv.SetQualityThreshold Method

Sets image quality threshold.

Pascal

```
procedure SetQualityThreshold(threshold: Byte);
```

Parameters

Parameters	Description
threshold: Byte	The fingerprint quality threshold. The value should be in range [0, 255]. The default value is 100.

4.4.1.1.1.3.13 TNffv.Verify Method

Compares a captured fingerprint with the one that was enrolled to a database before in order to determine whether two match.

Pascal

```
function Verify(user: TNffvUser; timeout: LongWord; var engineStatus: TNffvStatus): LongInt;
```

Parameters

Parameters	Description
user: TNffvUser	A reference to a database record that should be matched with the scanned fingerprint.
timeout: LongWord	Specifies the time in milliseconds after which the fingerprint scanner stops scanning fingerprint. This usually happens when a finger is removed from a scanner for longer than timeout milliseconds.
var engineStatus: TNffvStatus	Verification status value.

Returns

This function returns a matching score.

4.4.1.2 Functions

The following table lists functions in this documentation.

Functions

	Name	Description
	EngineStatusString (see page 78)	Gets a string message that hold information about TNffv (see page 74) status.
	GetAvailableScannerModules (see page 79)	Returns available fingerprint scanner modules for usage in the Free Fingerprint Verification SDK.
	NffvFreeMemory (see page 79)	Releases memory allocated by the GetAvailableScannerModules (see page 79) function.
	NffvGetInfo (see page 79)	Gets information about the Nffv (see page 73) library.

4.4.1.2.1 Nffv.EngineStatusString Function

Gets a string message that hold information about TNffv (see page 74) status.

Pascal

```
function EngineStatusString(status: TNffvStatus): string;
```

Parameters

Parameters	Description
status: TNffvStatus	NffvStatus (see page 43) object.

Returns

String message that hold information about TNffv (see page 74) status.

4.4.1.2.2 Nffv.GetAvailableScannerModules Function

Returns available fingerprint scanner modules for usage in the Free Fingerprint Verification SDK.

Pascal

```
function GetAvailableScannerModules: String;
```

Returns

String that hold available fingerprint scanners. Each fingerprint scanner module is separated by a semicolon.

4.4.1.2.3 Nffv.NffvFreeMemory Function

Releases memory allocated by the GetAvailableScannerModules (see page 79) function.

Pascal

```
procedure NffvFreeMemory(point: PChar); stdcall;
```

Parameters

Parameters	Description
point: PChar	Memory block to release.

4.4.1.2.4 Nffv.NffvGetInfo Function

Gets information about the Nffv (see page 73) library.

Pascal

```
function NffvGetInfo: TNLibraryInfo;
```

Returns

Object which type is TNlibraryInfo.

4.4.1.3 Structs, Records, Enums

The following table lists structs, records, enums in this documentation.

Enumerations

	Name	Description
	TNffvStatus (see page 79)	Enumerates enrollment or verification status values.

4.4.1.3.1 Nffv.TNffvStatus Enumeration

Enumerates enrollment or verification status values.

Pascal

```
TNffvStatus = (
  nfesNone = 0,
  nfesTemplateCreated = 1,
  nfesNoScanner = 2,
  nfesScannerTimeout = 3,
  nfesUserCanceled = 4,
  nfesQualityCheckFailed = 100
);
```

Members

Members	Description
nfesTemplateCreated = 1	Indicates that the fingerprint template was created.

nfesNoScanner = 2	Indicates that there is no fingerprint scanner connected.
nfesScannerTimeout = 3	Indicates that the fingerprint scanner has reached the timeout.
nfesUserCanceled = 4	Indicates that a user has canceled a fingerprint scanning.
nfesQualityCheckFailed = 100	Indicates that the Free Fingerprint Verification SDK had failed to check the quality of a fingerprint.

4.4.1.4 Constants

The following table lists constants in this documentation.

Constants

Name	Description
dllName (see page 80)	Name of the dll that provides the main functionality of the FFV SDK.

4.4.1.4.1 Nffv.dllName Constant

Name of the dll that provides the main functionality of the FFV SDK.

Pascal

```
dllName = 'Nffv.dll';
```

4.4.2 NffvUser Namespace

Provides methods and properties for working with users.

Module

Delphi Reference (see page 73)

Classes

	Name	Description
	TNffvUser (see page 80)	Provides methods and properties for working with users.

Constants

Name	Description
dllName (see page 81)	Name of the dll that provides the main functionality of the FFV SDK.

4.4.2.1 Classes

The following table lists classes in this documentation.

Classes

	Name	Description
	TNffvUser (see page 80)	Provides methods and properties for working with users.

4.4.2.1.1 TNffvUser Class

Provides methods and properties for working with users.

Pascal

```
TNffvUser = class;
```

Class Hierarchy

NffvUser.TNffvUser

Methods

	Name	Description
	Create (see page 81)	Creates a new instance of the TNffvUser.

TNffvUser Methods

	Name	Description
	GetId (see page 81)	Retrieves user's Id.
	GetImage (see page 81)	Retrieves a fingerprint image of the concrete user.

4.4.2.1.1.1 TNffvUser.Create Constructor

Creates a new instance of the TNffvUser (see page 80).

Pascal

```
constructor Create(handle: Pointer);
```

4.4.2.1.1.2 TNffvUser Methods

4.4.2.1.1.2.1 TNffvUser.GetId Method

Retrieves user's Id.

Pascal

```
function GetId: LongInt;
```

Returns

User's Id.

4.4.2.1.1.2.2 TNffvUser.GetImage Method

Retrieves a fingerprint image of the concrete user.

Pascal

```
function GetImage: TBitmap;
```

Returns

Bitmap object that contains user's fingerprint data.

4.4.2.2 Constants

The following table lists constants in this documentation.

Constants

Name	Description
dllName (see page 81)	Name of the dll that provides the main functionality of the FFV SDK.

4.4.2.2.1 NffvUser.dllName Constant

Name of the dll that provides the main functionality of the FFV SDK.

Pascal

```
dllName = 'Nffv.dll';
```

4.5 VB6 Reference

This chapter provides the Free Fingerprint Verification SDK programming reference for VB6 programming language.

Notes

These files under directory *\samples\VB6* are used for building VB6 wrapper of the FFV SDK:

- Nffv.cls
- NffvUser.cls
- Nffv.bas

Functions

Name	Description
ClearUsers (see page 82)	Removes all users from a users database.
Enroll (see page 83)	Gets a fingerprint from a scanner and saves it to a database.
GetHandle (see page 83)	Gets a handle to the NffvUser (see page 87).
GetHBitmap (see page 83)	Gets a handle to the bitmap of a user fingerprint.
GetMatchingThreshold (see page 84)	Gets the minimum similarity value that verification function uses to determine whether the fingerprint matches.
GetQualityThreshold (see page 84)	Gets image quality threshold.
GetUserCount (see page 84)	Gets the number of users that the Nffv (see page 87) contains.
GetImage (see page 84)	Gets a fingerprint image which was enrolled to a database for user.
GetUser (see page 85)	Returns a user details by the specified index.
GetUserId (see page 85)	Returns user's Id.
Nffv_GetAvailableScannerModules (see page 85)	Returns available fingerprint scanner modules for usage in the Free Fingerprint Verification SDK.
RemoveUser (see page 85)	Removes a user specified by an index from a database.
SetMatchingThreshold (see page 86)	Sets the minimum similarity value that verification function uses to determine whether the fingerprint matches.
SetQualityThreshold (see page 86)	Sets image quality threshold.
Verify (see page 86)	Compares a captured fingerprint with the one that was enrolled to a database before in order to determine whether two match.

Types

Name	Description
Nffv (see page 87)	This type provides the main functionality of the FFV SDK.
NffvStatus (see page 87)	Enumerates different enrollment and verification status values.
NffvUser (see page 87)	This type is used to define a user who was enrolled to database.
NLibraryInfo (see page 88)	This type provides library information.

4.5.1 Functions

4.5.1.1 ClearUsers

Removes all users from a users database.

VB6

```
Public Sub ClearUsers()
```

Module

VB6 Reference (see page 82)

4.5.1.2 Enroll

Gets a fingerprint from a scanner and saves it to a database.

VB6

```
Public Function Enroll(ByVal timeout As Long, ByRef engineUser As NffvUser) As NffvStatus
```

Parameters

Parameters	Description
timeout	Specifies the time in milliseconds after which the fingerprint scanner stops scanning fingerprint. This usually happens when a finger is removed from a scanner for longer than timeout milliseconds.
engineUser	User that should be enrolled to database.

Returns

A reference to NffvUser (see page 87) object which provides methods for managing enrolled users.

Module

VB6 Reference (see page 82)

4.5.1.3 GetHandle

Gets a handle to the NffvUser (see page 87).

VB6

```
Friend Function GetHandle() As Long
```

Returns

A handle to the NffvUser (see page 87).

Module

VB6 Reference (see page 82)

4.5.1.4 GetHBitmap

Gets a handle to the bitmap of a user fingerprint.

VB6

```
Friend Function GetHBitmap() As Long
```

Returns

Handle to a bitmap object.

Module

VB6 Reference (see page 82)

4.5.1.5 GetMatchingThreshold

Gets the minimum similarity value that verification function uses to determine whether the fingerprint matches.

VB6

```
Public Function GetMatchingThreshold() As Long
```

Returns

The minimum similarity value that verification function accept for the same finger fingerprints.

See Also

Matching Threshold (see page 13)

Module

VB6 Reference (see page 82)

4.5.1.6 GetQualityThreshold

Gets image quality threshold.

VB6

```
Public Function GetQualityThreshold() As Byte
```

Returns

The fingerprint quality threshold. The value should be in range [0, 255]. The default value is 100.

See Also

Quality Threshold (see page 13)

Module

VB6 Reference (see page 82)

4.5.1.7 GetUserCount

Gets the number of users that the Nffv (see page 87) contains.

VB6

```
Public Function GetUserCount() As Long
```

Returns

The number of users in the Nffv (see page 87).

Module

VB6 Reference (see page 82)

4.5.1.8 GetImage

Gets a fingerprint image which was enrolled to a database for user.

VB6

```
Friend Function GetImage() As IPictureDisp
```

Returns

IPictureDisp object that exposes the picture object's properties.

Module

VB6 Reference (see page 82)

4.5.1.9 GetUser

Returns a user details by the specified index.

VB6

```
Public Function GetUser(ByVal index As Long) As NffvUser
```

Parameters

Parameters	Description
index	Index of a user in the database.

Returns

A reference to NffvUser (see page 87) object which provides methods for managing enrolled users.

Module

VB6 Reference (see page 82)

4.5.1.10 GetUserId

Returns user's Id.

VB6

```
Friend Function GetUserId() As Long
```

Returns

Id that identifies a user.

Module

VB6 Reference (see page 82)

4.5.1.11 Nffv_GetAvailableScannerModules

Returns available fingerprint scanner modules for usage in the Free Fingerprint Verification SDK.

VB6

```
Public Function Nffv_GetAvailableScannerModules() As String
```

Returns

A string that contains the list of scanners separated by semicolons.

Module

VB6 Reference (see page 82)

4.5.1.12 RemoveUser

Removes a user specified by an index from a database.

VB6

```
Public Sub RemoveUser(ByVal index As Long)
```

Parameters

Parameters	Description
index	Index of a user that should be removed.

Module

VB6 Reference (see page 82)

4.5.1.13 SetMatchingThreshold

Sets the minimum similarity value that verification function uses to determine whether the fingerprint matches.

VB6

```
Public Sub SetMatchingThreshold(ByVal matchingThreshold As Long)
```

Parameters

Parameters	Description
matchingThreshold	Matching threshold to set.

See Also

Matching Threshold (see page 13)

Module

VB6 Reference (see page 82)

4.5.1.14 SetQualityThreshold

Sets image quality threshold.

VB6

```
Public Sub SetQualityThreshold(ByVal qualityThreshold As Byte)
```

Parameters

Parameters	Description
qualityThreshold	Quality threshold to set.

See Also

Quality Threshold (see page 13)

Module

VB6 Reference (see page 82)

4.5.1.15 Verify

Compares a captured fingerprint with the one that was enrolled to a database before in order to determine whether two match.

VB6

```
Public Function Verify(ByRef engineUser As NffvUser, ByVal timeout As Long, ByRef score As
Long) As NffvStatus
```

Parameters

Parameters	Description
engineUser	Selected user that should be verified.

timeout	Specifies the time in milliseconds after which the fingerprint scanner stops scanning fingerprint. This usually happens when a finger is removed from a scanner for longer than timeout milliseconds.
score	Matching score of verification.

Returns

This function returns a reference to the NffvStatus (see page 43).

Module

VB6 Reference (see page 82)

4.5.2 Types

4.5.2.1 Nffv

This type provides the main functionality of the FFV SDK.

Module

VB6 Reference (see page 82)

4.5.2.2 NffvStatus

Enumerates different enrollment and verification status values.

VB6

```
Public Enum NffvStatus
    nfesNone = 0
    nfesTemplateCreated = 1
    nfesNoScanner = 2
    nfesScannerTimeout = 3
    nfesQualityCheckFailed = 100
End Enum
```

Parameters

Parameters	Description
nfesTemplateCreated	Indicates that the fingerprint template was created.
nfesNoScanner	Indicates that there is no fingerprint scanner connected.
nfesScannerTimeout	Indicates that the fingerprint scanner has reached the timeout.
nfesQualityCheckFailed	Indicates that the Free Fingerprint Verification SDK had failed to check the quality of a fingerprint.

Module

VB6 Reference (see page 82)

4.5.2.3 NffvUser

This type is used to define a user who was enrolled to database.

Module

VB6 Reference (see page 82)

4.5.2.4 NLibraryInfo

This type provides library information.

VB6

```
Public Type NLibraryInfo
    Title As String * 64
    Product As String * 64
    Company As String * 64
    Copyright As String * 64
    VersionMajor As Long
    VersionMinor As Long
    VersionBuild As Long
    VersionRevision As Long
    DistributorId As Long
    SerialNumber As Long
End Type
```

Parameters

Parameters	Description
Title	Title of the library.
Product	Product's name.
Company	Company's name.
Copyright	Copyright notice from the library.
VersionMajor	Library's major version.
VersionMinor	Library's minor version.
VersionBuild	Library build version.
VersionRevision	Library's revision number.
DistributorId	Library's Id.
SerialNumber	Library's serial number.

Module

VB6 Reference (see page 82)

5 Distribution Content

The Free Fingerprint Verification SDK contains these files and folders:

File	Description
FFVSDKSetup.exe	The free fingerprint verification SDK setup wizard.

/bin

/Win32_x86 - this directory contains files for Windows-based operating systems running on 32-bit x86 CPU. This directory contains these files and folders:

File	Description
EN	This folder contains a XML documentation for using in Microsoft Visual Studio.
CppSample.exe	An executable C++ sample application.
CSharpSample.exe	An executable C# sample application.
DelphiSample.exe	An executable Delphi sample application.
Neurotec.Biometrics.Nffv.dll	Provides the main functionality of the FFV SDK. This Dll is a wrapper of Nffv.dll
Nffv.dll	Provides the main functionality of the FFV SDK.
VBNETSample.exe	An executable VB.NET sample application.
VB6Sample.exe	An executable VB6 sample application
NffvServer.exe	Nffv.dll helper.
NffvSample.jar Nffv.jar NffvJavaNative.dll NffvSample.html	Files for Java sample.

/Win32_x86/fpsmm - a directory containing scanner files:

File	Description
FPSmmJstac.dll WIS_API.dll WisCmos2.dll	Athena 210 module.
Additional/FPSmmIdentix.dll	Identix DFR 2080, DFR 2090, DFR 2100 scanners module. Drivers not included. FPSmmIdentix.dll file used with Itf32_2080U2.dll.
Additional/FPSmmNitgen.dll	NITGEN Fingkey Hamster & Fingkey Hamster II scanners module. Drivers included: "\install\FingerprintScanners\NITGEN\". FPSmmNitgen.dll file used with NBioBSP.dll.
Additional/FPSmmSecugenHFDU02.dll Additional/FPSmmSecugenHFDU03.dll Additional/FPSmmSecugenHFDU04.dll	SecuGen Hamster III, Hamster Plus, Hamster IV modules. Drivers included: "\install\Fingerprint Scanners\SecuGen\".
FPSmmAuthentec.dll	AuthenTec AES4000, AF-S2, Zvetco P4000 sensors module.
FPSmmAuthenTec2501.dll ATSC63.dll	AuthenTec AES2501B module.
FPSmmAtmel.dll FingerChip.dll	Atmel FingerChip sensor module. Drivers included: "\install\Fingerprint Scanners\Atmel\".

FPSmmBiometrika.dll fx3.dll fx3scan.dll	Biometrika FX2000, FX3000 and HiScan scanners module. Drivers included: "\install\Fingerprint Scanners\BiometriKa\".
FPSmmCertis.dll CertisExports.dll Id3BiokeyDll.dll	Certis Image scanner module. Drivers included: "\install\Fingerprint Scanners\id3\".
FPSmmCrossMatch.dll	CrossMatch V300/V300LC/LC2.0 scanners module. Drivers can be downloaded from CrossMatch website (option "USB SDK for Verifier and MV5 Scanners/Readers").
FPSmmCyte.dll CaptureSDK.dll	Testech Bio-i scanner module. Drivers included: "\install\Fingerprint Scanners\Testech\".
FPSmmDactyScan.dll FSM26U.dll	Green Bit DactyScan 26 scanner module. Drivers not included.
FPSmmDigent.dll IZZIX.dll	Digent Izzix FD1000 scanner module. Drivers included: "\install\Fingerprint Scanners\Digent\".
FPSmmFM200.dll fm200api.dll FingerPrinterDll. fm200drv.dll	Startek FM200 scanner module. Drivers included: "\install\Fingerprint Scanners\Startek\".
FPSmmFujitsu.dll libusb0.dll	Fujitsu MBF200 scanner module. Drivers included: "\install\Fingerprint Scanners\Fujitsu\".
FPSmmFutronicEthernetFam.dll FPSmmFutronicEthernetFam.ini	Futronic Ethernet FAM scanner module. Remarks FPSmmFutronicEthernetFam.ini file is intended for scanner configuration. Scanner IP address and port should be placed in file. Drivers included: "\install\Fingerprint Scanners\Futronic\"
FPSmmFutronic.dll ftrScanAPI.dll	Futronic FS80, FS88, BioLink U-Match MatchBook v.3.5 scanners module. Drivers included: "\install\Fingerprint Scanners\Futronic\". Note Configuration "futronic.cfg" file with parameter LFD = false will turn of the life fingerprint detection. For BioLink U-Match MatchBook v.3.5 scanner file should be created all the time.
Itf32_2080U2.dll	Identix DFR 2080, DFR 2090, DFR 2100 scanners module. Drivers not included. Itf32_2080U2.dll file used with FPSmmIdentix.dll.
FPSmmLighTunning.dll GetImageC500.dll	LighTunning LTT-C500 scanner module. Drivers not included.
fpsmm/FPSmmUPEK.dll fpsmm/TCI.dll	UPEK TouchChip TCRU1C, TCRU2C and Zvetco P5000 sensors module. Drivers included: "\install\Fingerprint Scanners\UPEK\".
FPSmmTacoma.dll SmzCmos1.dll SMZ_API.dll	Tacoma CMOS scanner module. Drivers included: "\install\Fingerprint Scanners\Tacoma\".
FPSmmUareU.dll	Digital Persona U.are.U 2000/4000S/4000B scanner module. Drivers included: "\install\Fingerprint Scanners\DigitalPersona\".
NBioBSP.dll	NITGEN Fingkey Hamster & Fingkey Hamster II, NITGEN eNBioScan-F scanners module. Drivers included: "\install\Fingerprint Scanners\NITGEN\". NBioBSP.dll file used with FPSmmNitgen.dll.

SPM/ plugin/ LumiAPI.dll LumiCore.dll FPSmmLumidigm.dll	Lumidigm Venus Series sensor module. Drivers included: "\install\Fingerprint Scanners\Lumidigm\". Lumidigm fingerprint scanner configuration file "lumidigm.cfg" contains these parameters: LFD (used for enabling Lumidigm Venus Series sensor scanner when value is "true" or "enable") and LFDThreshold (used for setting threshold value). Dafault parameter's LFDThreshold value is 7000. Also parameter value should be greater than 0.
FPSmmTSTBIRD.dll TSTBasic.dll	TST Biometrics BiRD 3 scanner module. Drivers can be downloaded from TST Biometrics website http://www.tst-biometrics.com/.
FPSmmHongda.dll GALS0410.dll	Hongda S680 module. Drivers included: "\install\Fingerprint Scanners\Hongda\".
FPSmmDermalog.dll DermalogVC3.dll Other files Additional/DermalogCalibrateSDK.dll Additional/DermalogLoggingFacility.dll Additional/DermalogPLS1.cfg Additional/DermalogPLS1.dll Additional/ZFScanAPI.dll should be copied in current directory, e.i. in the same as FPScannerMan.dll.	Dermalog ZF1 module. Drivers included: "\install\Fingerprint Scanners\Dermalog\".
FPSmmDakty.dll DaktyImage.dll fpd.dll fpdusb.dll Segmentation.dll	Dakty Fingerprint NAOS-A module. Drivers included: "\install\Fingerprint Scanners\DaktyFpdNaosA\".
FPSmmZKSensor6000.dll	ZKSensor6000 fingerprint scanner module.Drivers included: "\install\Fingerprint Scanners\ZKSoftware\".

Recommendations:

1. "fpsmm" folder must be located in the same folder as FPScannerMan.dll; "fpsmm" folder must contain required scanners modules.

2. Copy only required DLL files; for example, if CrossMatch is not used, FPSmmCrossMatch.dll should not be copied.

4. Add folder containing FPScannerMan.dll into system PATH variable in order to avoid “DLL not found” problems.

Known conflicts/issues:

1. Nitgen, Identix and SecuGen drivers can conflict with each other. We would recommend to use only one FPSmmIdentix.dll, FPSmmNitgen.dll or FPSmmSecuGen.dll file at the same time.

2. FPSmmCrossMatch.dll loading time is quite long; if CrossMatch scanner is not used, we would recommend exclude FPSmmCrossMatch.dll from application distribution.

3. Dermalog ZF1 and Futronic FS80, FS88 scanners can not work together.

/documentation

File	Description
Free_Fingerprint_Verification_SDK.chm	Documentation file in pdf.
Free_Fingerprint_Verification_SDK.chm	Documentation file in chm.
license.htm	License agreement.

/Include

/Windows

This directory contains header files.

/install

/Fingerprint Scanners

This directory contains drivers for some fingerprint scanners.

/lib

/Win32_x86

This directory contains lib files that are used by the Free Fingerprint Verification SDK.

/redistributable

/Win32_x86

File	Description
FFVSDKRedistributable.exe	A program used to redistribute your application (including Neurotechnology DLL files).
FFVSDKRedistributable.txt	Text file that describes how to use FFV SDK redistributable.

/samples

This directory contains files for sample applications. The folder under this directory:

Folder	Description
Cpp	This folder contains files for C++ sample application.
CSharp	This folder contains files for C# sample application.
Java	This folder contains files for Java sample application.
VB.NET	This folder contains files for VB.NET sample application.
VB6	This folder contains files for VB6 sample application.
Delphi	This folder contains files for Delphi sample application.

6 Error Codes

The possible error codes of errors that can occur when using the FFV SDK.

Error code	Error	Description
0	N_OK	No error.
-1	N_E_FAILED	Unspecified error has occurred.
-2	N_E_CORE	Standard error has occurred (for internal use).
-3	N_E_NULL_REFERENCE	Null reference has occurred (for internal use).
-4	N_E_OUT_OF_MEMORY	There were not enough memory.
-5	N_E_NOT_IMPLEMENTED	Functionality is not implemented.
-6	N_E_NOT_SUPPORTED	Functionality is not supported.
-7	N_E_INVALID_OPERATION	Attempted to perform invalid operation.
-8	N_E_OVERFLOW	Arithmetic overflow has occurred.
-9	N_E_INDEX_OUT_OF_RANGE	Index is out of range (for internal use).
-10	N_E_ARGUMENT	Argument is invalid.
-11	N_E_ARGUMENT_NULL	Argument value is NULL where non-NULL value was expected.
-12	N_E_ARGUMENT_OUT_OF_RANGE	Argument value is out of range.
-13	N_E_FORMAT	Format of argument value is invalid.
-14	N_E_IO	Input/output error has occurred.
-15	N_E_END_OF_STREAM	Attempted to read file or buffer after its end.
-90	N_E_EXTERNAL	Error in external code has occurred (for internal use).
-91	N_E_WIN32	Win32 error has occurred.
-92	N_E_COM	COM error has occurred.
-93	N_E_CLR	CLR exception has occurred.
-100	N_E_PARAMETER	Parameter ID is invalid.
-101	N_E_PARAMETER_READ_ONLY	Attempted to set read only parameter.

7 FAQ

There are listed frequently asked questions (FAQ) and answers to them.

1. **When I have enrolled 10 users to a database and try to add more users I get an error message "Nffv (see page 73) already contains NFFV_MAX_USER_COUNT (see page 44) users. Code: -7". How can I add more users?**

The Free Fingerprint Verification SDK allows to add up to 10 users to a database. If you need to add new users, you should remove other users.

If you have an intention of developing a larger scale application or system with unlimited users count, server or cluster support, please contact Neurotechnology for guidelines for other products.

2. **Is it possible to save an original fingerprint image to a hard disk?**

No, it is not possible. If you need to save an original fingerprint image, you can use the VeriFinger SDK.

3. **Can I use several different fingerprint scanners?**

Yes, you can use different fingerprint scanners simultaneously. But you should note that several scanners takes more time to load.

4. **What is a maximum matching score of two fingerprints?**

There is no maximum score. For more information about see chapter Matching threshold (see page 13).

5. **When I run Java sample applet my browser crashes. Where can be a problem?**

Usually Java applet crashes when another instance of Java sample application (or other application that loads the Nffv.dll to memory) is running on a computer. Please close other Java sample applications on a computer when loading Java applet.

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