BioMini SDK for Windows

v3.6.0

Table of Contents

1. Introduction

The BioMini SDK provides the specific functions to capture fingerprints, to display scanner real-time images on the screen while the finger is on the platen and includes all PC interfaces and drivers.

1.1 What's New

Version 3.6

- Compatible with new Suprema fingerprint scanners
  - BioMini Plus2 (SFR550)
- UFScanner - UFS_CaptureSingleUI function added
  - Performs same as UFS_CaptureSingle and Popup Window appears
- UFMatcher - UFM_VerifyEx function added
  - Performs same as UFM_Verify, and returns matching score by 6th parameter

1.2 History

Version 3.5.5

- Do not check license file(UFLicense.dat file removed)
- UFScanner - New APIs added
  - Save WSQ Image Buffer to variable size
  - Decompress WSQ format data to data of Bmp format
  - Get quality information of image(UFS_GetFPQuality)
  - Added EnrollUI, VerifyUI APIs
- UFDatabase is removed

Version 3.5.0

- Compatible with new Suprema fingerprint scanners
  - BioMini Slim (SFR600), BioMini Combo and SFU-S20
- UFScanner - UFS_StartAutoCapture added
  - Auto finger detect and capture function
- UFScanner - UFS_ExtractEx function added
  - Template extraction function for large size template
- UFScanner - UFS_SelectTemplateEx added
  - Template selection function for large size template

Version 3.4.2

- The SentinelHASP Basic USB dongle added for license control

Version 3.4.1

- Java JNA module fixed
    - Call the UFM_Identify_J instead of the UFM_Identify when using JNA module

Version 3.4

- Universal manufacturer ID embedded in scanners without license control

Version 3.3.1

- Support new sensor, which has AGC(Auto Gain Control) feature on BioMini
- Removed brightness setting from new sensor since the AGC automatically finds it's optimal brightness setting

Version 3.3.0

- Updated extraction and matching algorithm is applied
    - The performance on the low quality fingerprints is improved
- Applied advanced quality measure in extraction function
- Modified basic samples to use 1 template or 2 templates when enrollment
- Support JAVA JNI wrapper
- Added JAVA JNI demo sample
- Added latent fingerprint defense for BioMini
- Support ISO19794-4 image format saving in BioMini SDK
- Support WSQ image format saving in BioMini SDK

Version 3.2.0

- Support BioMini Plus - High quality sensor scanner
- LFD(live fingerprint detection) algorithm - the live finger detection algorithm.
- Support WSQ file format in Image SDK -UFExtractor
- Support image drawing function in Image SDK - UFExtractor
- Support feature drawing function in BioMini SDK - UFScanner
- Update sample demo of SDK and sample demo usage tutorial of manual

Version 3.1.0

- Support Java interfaces
- Support ANSI378 templates

Version 3.1.0.6

- Added BioMini Lock to Image SDK- License lock mode

Version 3.0.0

- Completely new interface compared with version 2.x
- Support full functionality for managing scanners
    - Support handling multiple devices
    - Support plug-and-play events
- Ensure thread safety for all functions
- Scanner, matcher, extractor and database are treated as independent objects

Version 3.0.0.15

- Added license scheme Using RSD(Real Scan Device)
- UFExtractor - Modify maximum image size 1024 x 1024 from 640 x 480

Version 3.0.0.14

- UFScanner, UFExtractor - Added function which get number of Minutiae
    - UFS_GetFeatureNumber, UFE_GetFeatureNumber
- UFMatcher - Added parameter for 360-degree matching.
    - UFM_PARAM_AUTO_ROTATE (If set 1 at SetParameter support 360-degree matching)

Version 3.0.0.13

- Support MAC address type license

Version 3.0.0.12

- UFMatcher - UFM_RotateTemplate function supports SIF type

Version 3.0.0.11

- Modify SFR200's extract algorithm parameter for template compatibility between SFR200 and OP2/OP3

Version 3.0.0.8

- Error correction about UFScanner.dll SFR300 Ver.2's Logon process

Version 3.0.0.7

- Modify UFDatabase.mdb file problem
- UFDatabase.dll - Add error syntax when DB open

Version 3.0.0.5

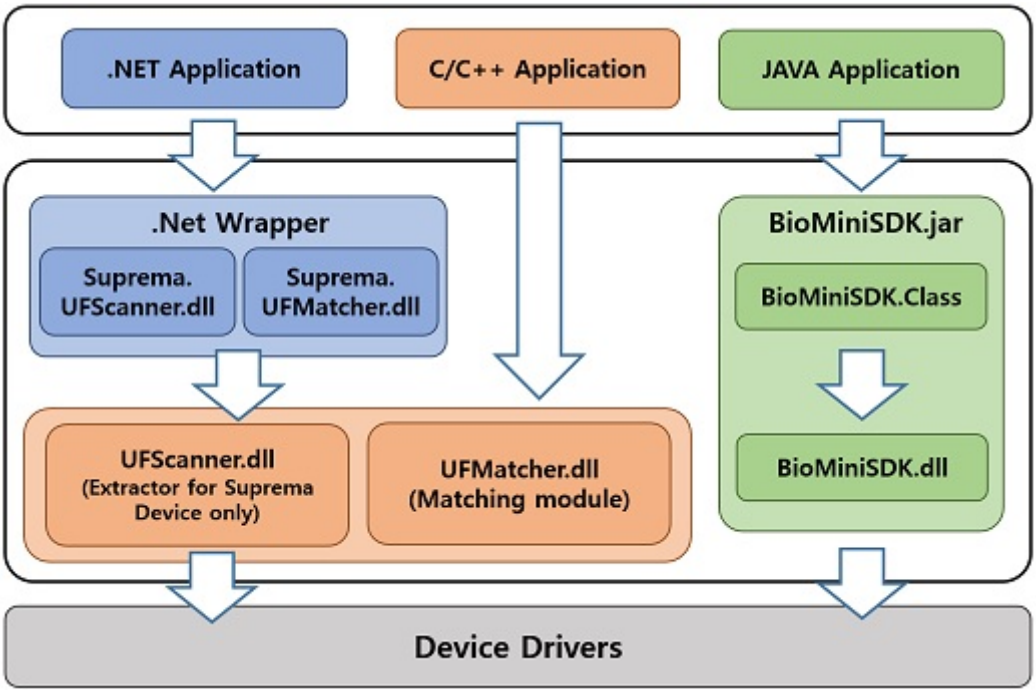
- UFExtractor - Add UFE_MODE_GENERAL mode (Using general image type)
- Modify maximum resolution 640 x 640
- Change UFScanner_IZZIX.dll to latest versions(1.1.6.22)

Version 3.0.0.4

- Modify Identify function Fast Mode and improve speed: About 20000 matches/sec

1.3 Overview

SDK Structure



BioMini SDK contains UFScanner module to control a device and UFMatcher module to perform verification & identification. Also, it provides Suprema.UFscanner.dll, Suprema.UFMatcher.dll for .net development and BioMiniSDK.jar file for JAVA development.

SDK Package Consists of

Path	File Name	Description
\bin	\cert\localhost_cert.crt	Certificate for localhost URL (replaceable with a file of the same name)
	\cert\localhost_cert.key	Key for the same
	\html\array.generics.min.js	Opensource library to support array functionality used in sample javascript
	\html\BiominiWebAgent.js	Javascript file to utilize Web-agent APIs (replaceable)
	\html\favicon.ico	Icon for localhost URL
	\html\index.html	Example page for web-api connected with web-agent
	\html\jquery.min.js	jQuery library for sample javascript file
	\res\en\img*.jpg \res\kr\img*.jpg \res\ps\img*.jpg	Background & buttion image sources for Enrollment UI. Replaceable on demand of your application design
	/java/BioMiniSDK.jar	Package file for BioMiniJNI
	demoBioMini.jar	package file for demoBioMini
	demoBioMini_java.bat	Script file to execute demoBioMini
	\x64*	Librariese and executable files for x64 platform
	AgentCtrl.exe	Web-Agent Control UI
	Biomini_DemoCS.exe	Demo using C#
	Biomini_DemoVBNET.exe	Demo using VB .NET
	Biomini_DemoVC.exe	Demo using VC++ 9.0
	MultiScannerDemo.exe	Multi scanner demo using VC++ 9.0
	Biomini_WebAgent.exe	Web-Agent Control console application
	CertMgr.exe	Certificate manage tool
	D.LC	Essential component of dignosis tool
	DiagnosisTool.exe	Diagnosis tool for Suprema fingerprint scanners
	IEnrollUI.dll	COM object DLL for Enrollment UI You should register(using regsvr32.exe) before you use Enrollment UI
	libeay32.dll, ssleay32.dll	Open SSL libraries
	MultiScannerDemo.exe	Multi scanner demo using VC++ 9.0
	Suprema.tlb	Type library for Visual Basic 6.0
	Suprema.UFMatcher.dll	Matcher module wrapper for .NET
	Suprema.UFScanner.dll	Scanner module wrapper for .NET
	UFMatcher.dll	Matcher module
	UFScanner.dll	Scanner module
	UFScanner_IZZIX.dl	Scanner sub module for SFR200
	register_enrollui.bat	Register EnrollUI dll to registry
\docs	BioMiniSDK_for_Windows_3.6_Reference_Manual.pdf	Reference Manual

Path	File Name	Description
\include	UFMatcher.h	Header file for matcher module
	UFScanner.h	Header file for scanner module
\install	\drivers\SFR Driver(unified)/Sup_Fingerprint_Driver_v2.2.0.exe	Universal driver for SFR400, SFR410, SFR500, SFR550, SFR600
	\drivers/SFR200*	Driver packages for SFR200
	\drivers/SFR300-S*	Driver packages for SFR300-S
	\drivers/SFR300(ver.2)*	Driver packages for SFR300-S(Ver.2)
	\Redistribution Package\vc2013redist_x64.exe	Visual Studio 2013 redistributable package(x64)
	\Redistribution Package\vc2013redist_x86.exe	Visual Studio 2013 redistributable package(x86)
	\Redistribution Package\vc2008redist_x86.exe	Visual Studio 2008 redistributable package(x86)
	\Redistribution Package\vc2008redist_x64.exe	Visual Studio 2008 redistributable package(x64)
\lib	UFMatcher.lib	Library file for matcher module
	UFScanner.lib	Library file for scanner module
	\x64*.lib	Library files for x64
\sample	\Java\demoBioMini.java	Contains image demo sample code for java
	\VS60\UFE30_DemoVB60*	Contains demo sample project for Visual Basic 6.0
	\VS90\Biomini_DemoVC*	Contains demo sample project for Visual C++ 9.0
	\VS90\Biomini_DemoCS*	Contains demo sample project for C#
	\VS90\Biomini_DemoVBNET*	Contains demo sample project for Visual Basic .NET
	\VS90\MultiScannerDemoVC*	Contains multi scanner demo sample project for Visual C++ 9.0

System Requirements

The following minimum system requirements are necessary in order to use the SDK described in this document

- **Operating System**:
  - Windows 7 / 8.1 / 10 (32/64bit)
- **Tools**:
  - Visual Studio 2008 (9.0) or higher (.NET Framework 3.5) - Visual C++, Visual C#, Visual Basic .NET
  - Java SDK 1.4 or higher (using JNI(Java Native Interface))
- **Hardware**:
  - CPU: Core 2 Due 2.4GHz
  - Memory: 1G or more memory
  - PC Interface: USB 2.0

2. Getting Started

2.1 SDK Installation

Installing the BioMini SDK copies all the required driver files into the same directory, where they can be easily accessed during the BioMini installation.

Installation Instructions

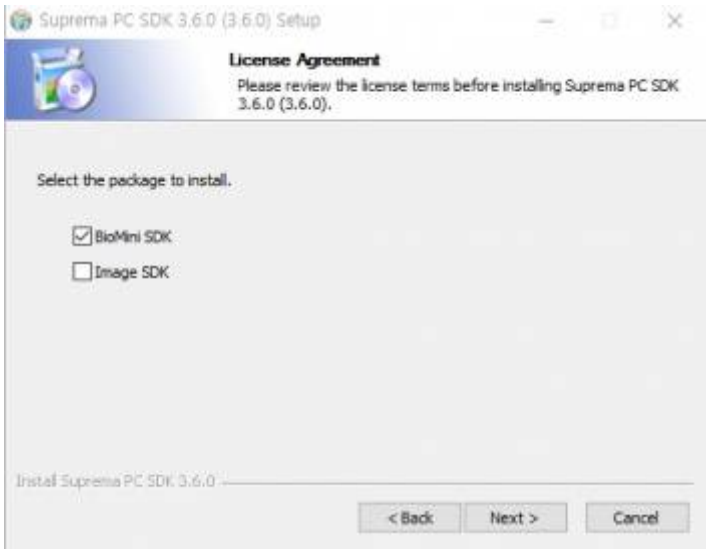
1. Disconnect the USB cable of device from the PC
2. Uninstall all previous versions of the BioMini SDK
3. Double click on BioMini SDK Setup_v3.6.exe
4. Use the default settings of the install program
5. Refer to the BioMini SDK v3.6 Documentation. You can find this documentation at *C:\Program Files\BioMini\docs*

Step-by-Step Installation Guide

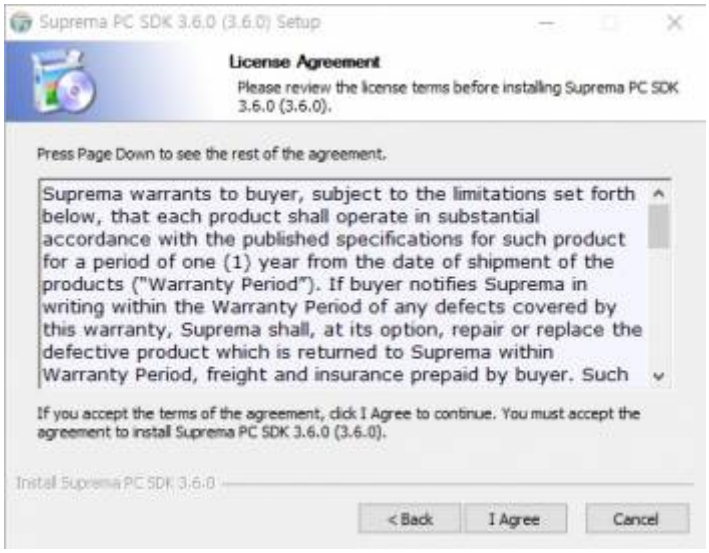
1. Disconnect the USB cable of device from the PC before proceeding to install the program

2. Click "Next" if the above screen appears after running "Setup_BioMini_SDK_3.6.exe"

3. Select the “BioMini SDK” and Click “Next” to continue

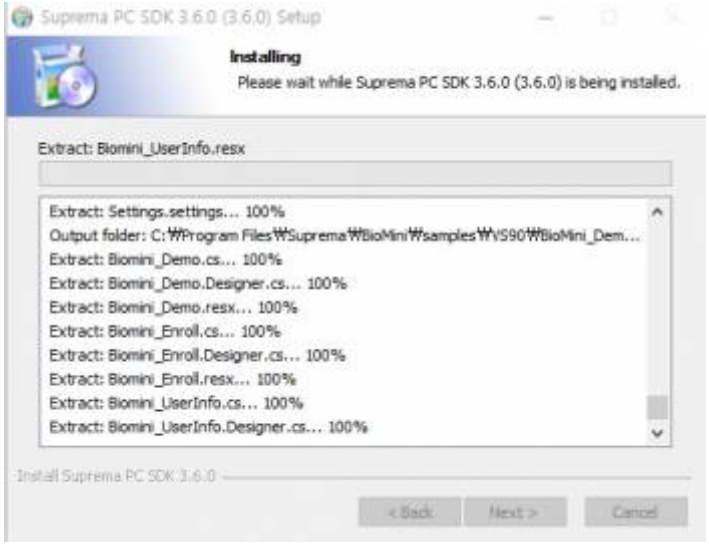


4. Click the I Agree to proceed the installation

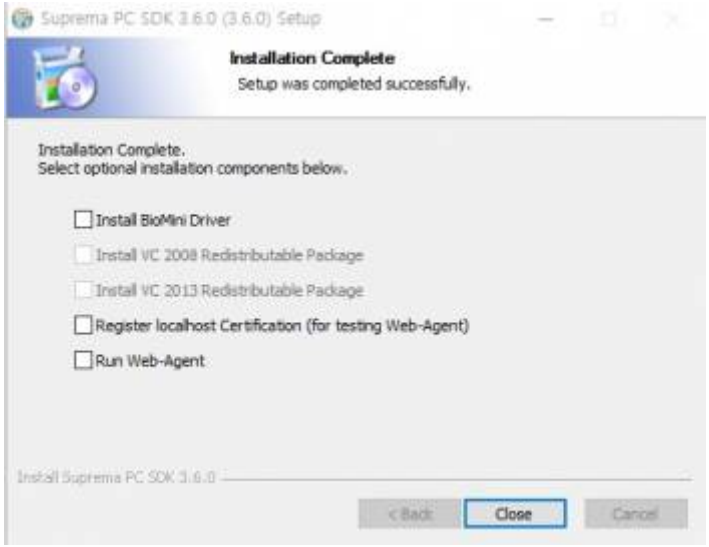


5. Click “Install” button to continue the installation

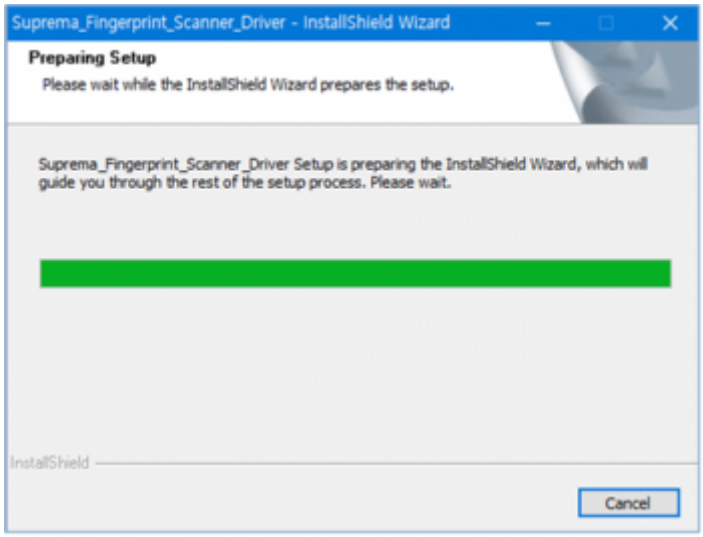
6. Installing(This process can take 5sec under)



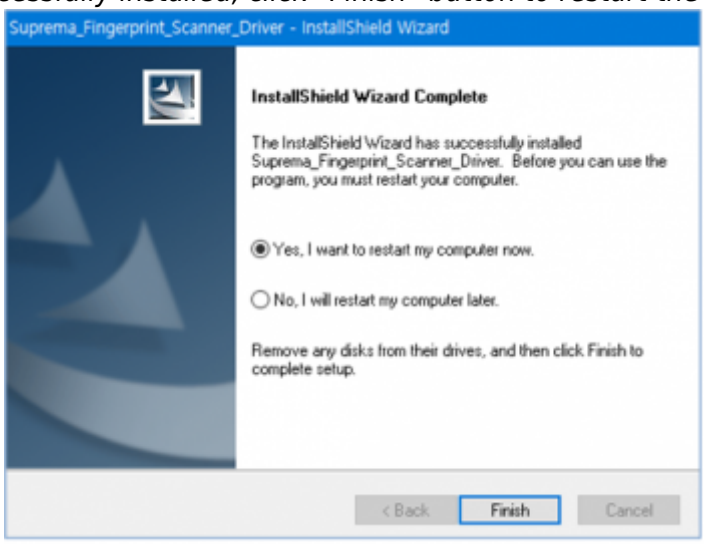
7. If the BioMini Device Driver is not installed, check the “Install BioMini Driver”, then click on close.



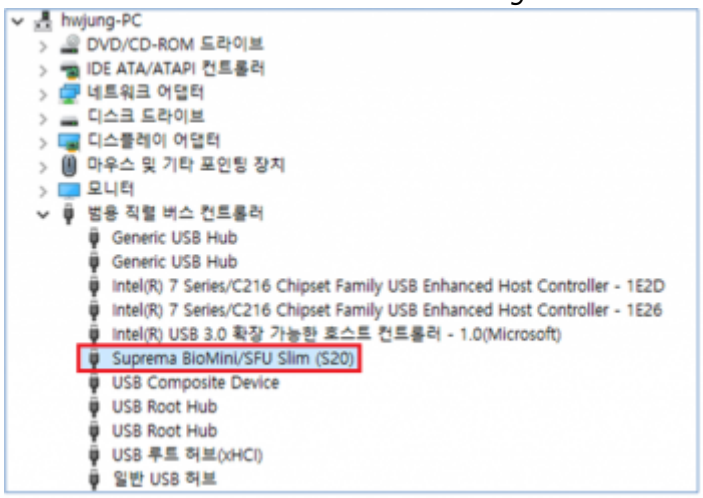
8. After installation of the SDK, BioMini Device Driver will be installed automatically.



9. Once the driver is successfully installed, click “Finish” button to restart the PC.



10. After installation, you can detect BioMini from device management if the BioMini is plugged in.



2.2 BioMini Demo Program

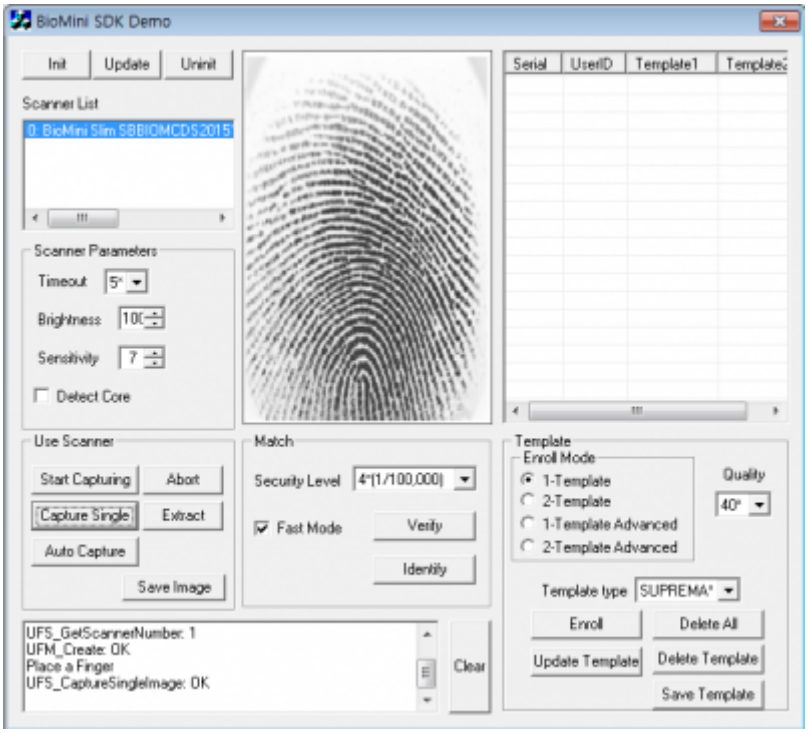
BioMini_Demo provides the basic usage about managing scanners and executing enrollment, verification and identification. This program uses UFScanner and UFMatcher modules.

Basic Demo

Executable File Location

- bin\Biomini_DemoCS.exe
- bin\Biomini_DemoVC.exe
- bin\Biomini_DemoVBNET.exe
- Java version
- Source code of all demo application

Picture of the Demo sample applications



User Interface Components

BioMini SDK Demo sample demonstrates how to use BioMini SDK roughly. Please use this sample as a reference for making your own program. BioMini SDK demo provides following methods:

- Initialize Scanner - A scanner should be initialized for using all functions about the scanner
- Enrolls fingerprint - A fingerprint can be enrolled by using BioMini scanner
- Verification - A fingerprint can be verified against enrolled fingerprint
- Identification - A fingerprint can be identified against every enrolled fingerprint
- Saves data - Saves a template file or a fingerprint image to BMP format

Every Biomini_Demo application is written by different languages from Visual C++ to JAVA. But they are made of same functions and same interface design.

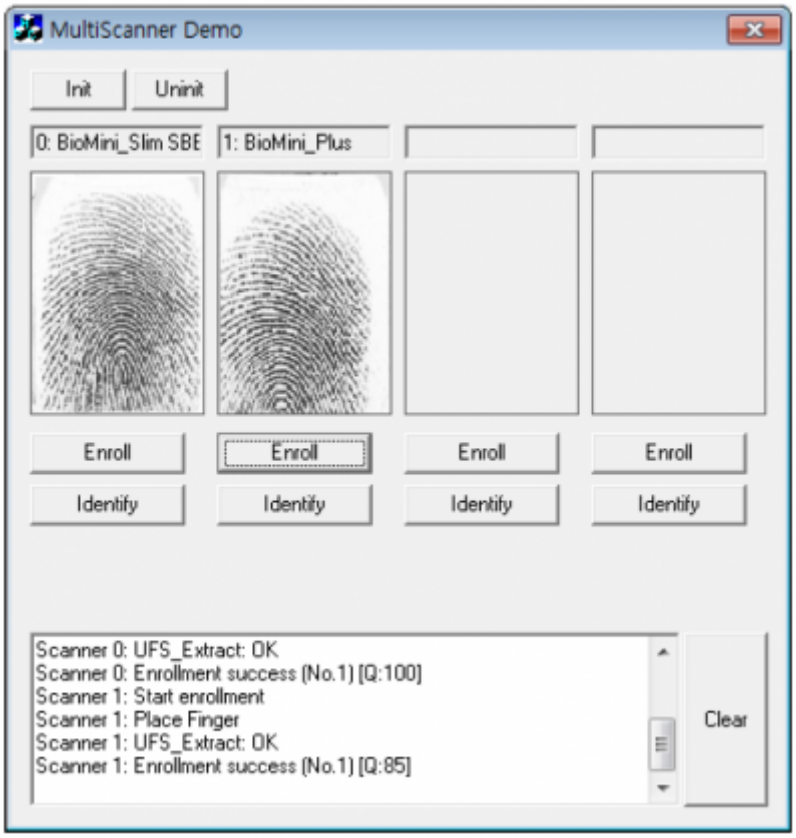
MultiScanner Demo

MultiScannerDemo provides the demo about using multiple scanners simultaneously. This Program uses UFScanner and UFMatcher modules.

Executable File Location

- bin\MultiScannerDemo.exe
- Source code of all demo application

Picture of the Demo sample applications



User Interface Components

BioMini SDK MultiScannerDemo sample demonstrates how to use BioMini SDK with multiple scanners. Please use this sample as a reference for making your own program. BioMini SDK Multiscanner demo provides following methods:

- Initialize Scanner - The scanners should be initialized for using the functions about the scanner
- Enroll fingerprint - A fingerprint can be enrolled by using BioMini scanner
- Identification - A fingerprint can be identified against every enrolled fingerprint

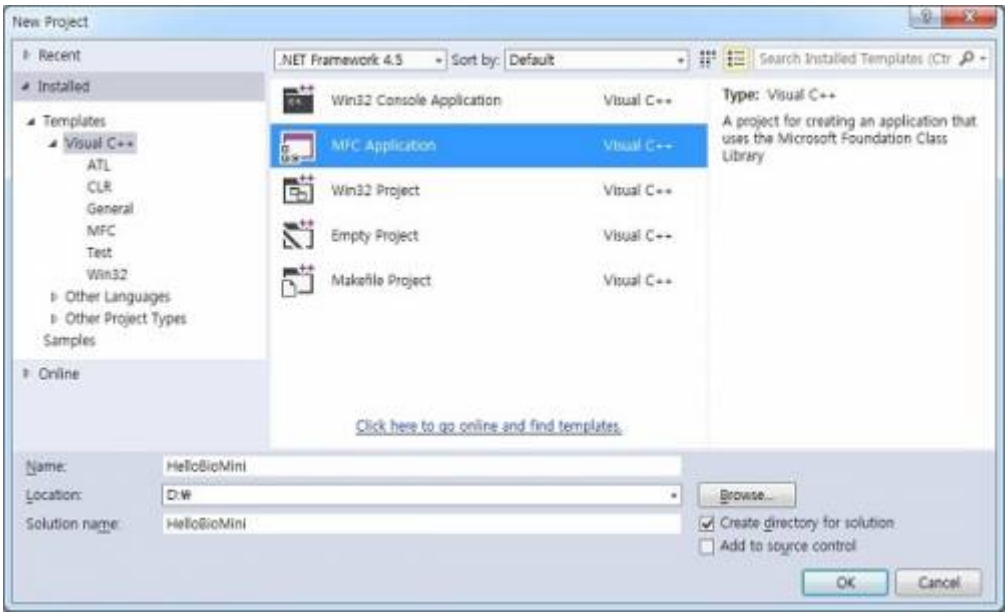
MultiScannerDemo application written in only Visual C++ language (VS9.0) The picture bellow shows the BioMini SDK MultiScannerDemo sample main window and description about bunch of interface components.

3. C/C++ Development

3.1 Environment Setting

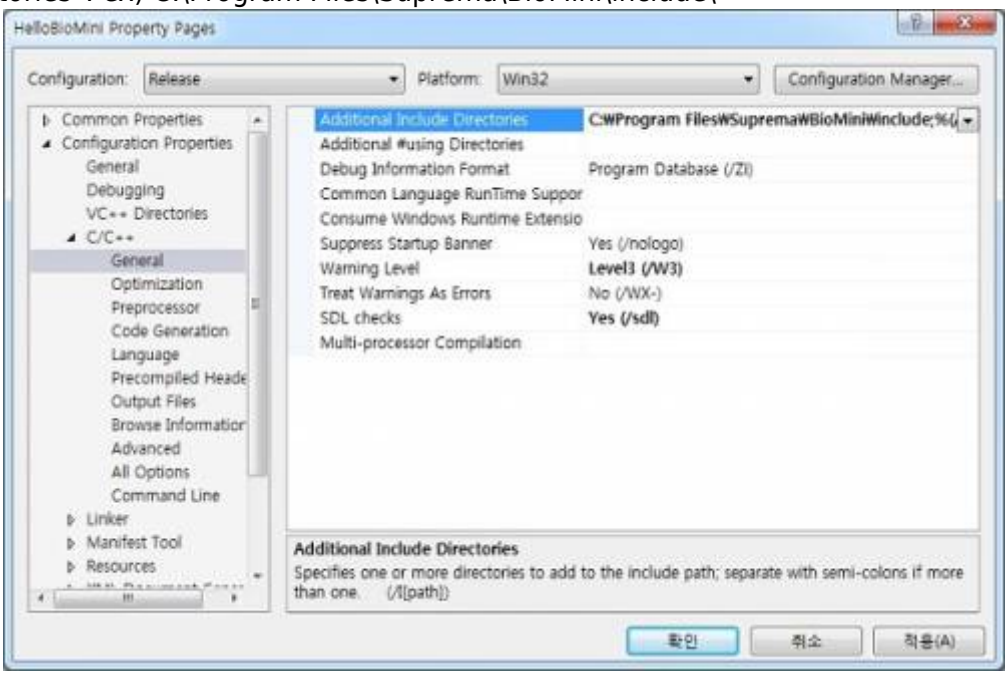
This section will expain how to import BioMini Libraries(UFScanner.dll, UFMatcher.dll) on Microsoft Visual Studio 2013.

1. Create new MFC Application project

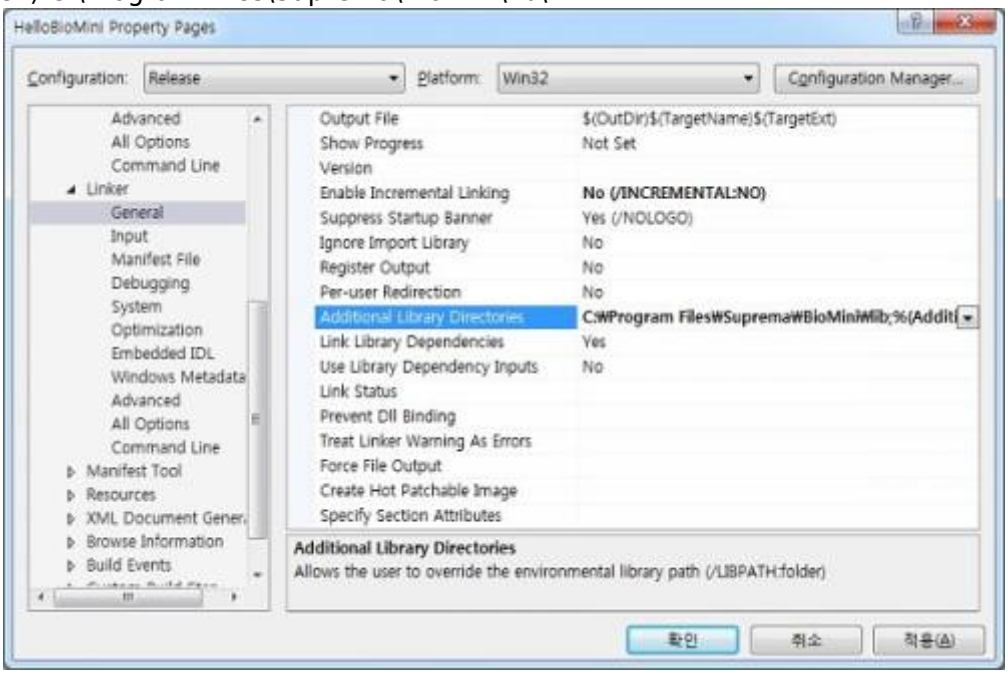


2. Select [Dialog based] for application type

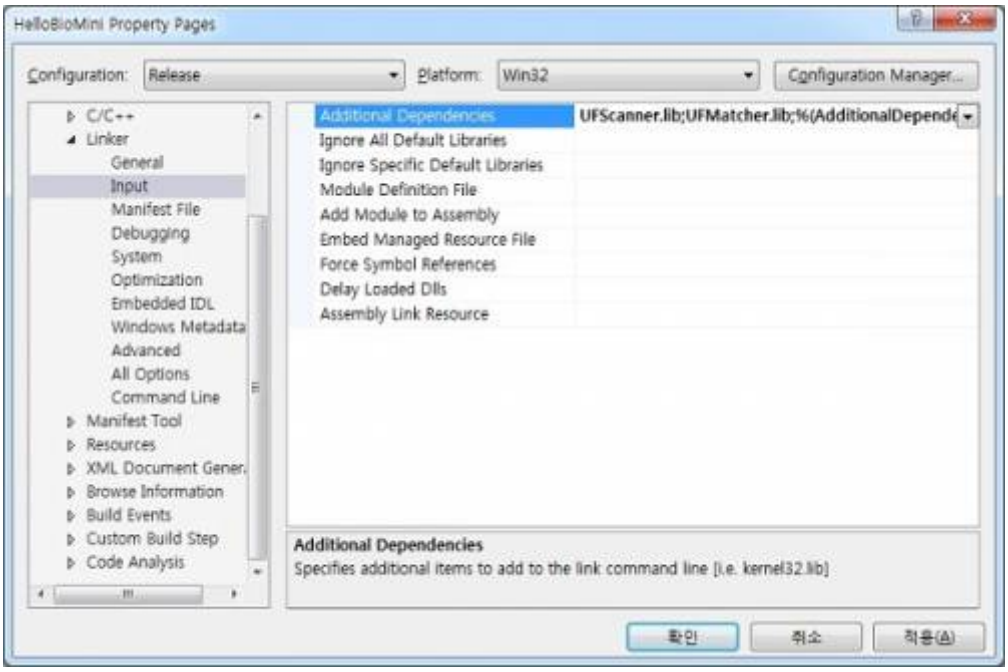
3. Add “%SDKDIR%include\” folder at “Project Property Pages → C/C++ → General → Additional Include Directories”. ex) C:\Program Files\Suprema\BioMini\include\



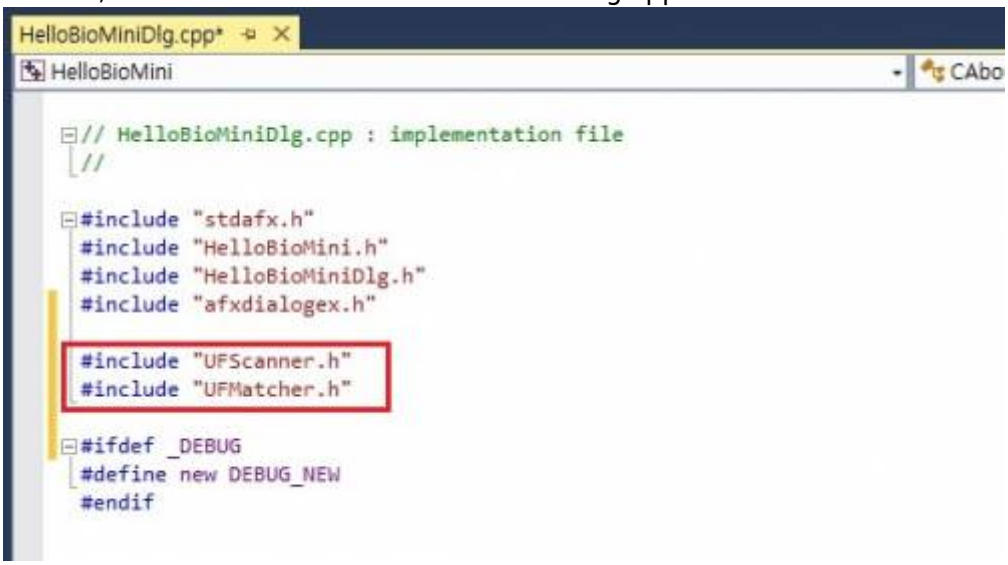
4. Add “%SDKDIR%lib\” folder at “Project Property Pages → Linker → General → Additional Library Directories”. ex) C:\Program Files\Suprema\BioMini\lib\



5. Add “UFScanner.lib, UFMatcher.lib” at “Project Property Pages → Linker → Input → Additional Dependencies”.



6. Add “UFScanner.h, UFMatcher.h” files to “HelloBioMiniDlg.cpp” source code.



7. Add initializing code as below at OnInitDialog( ) Message.

```
// TODO: Add extra initialization here
UFS_STATUS ufs_res;
ufs_res = UFS_Init();
if (ufs_res != UFS_OK) return TRUE;
int nScannerNumber = ;
ufs_res = UFS_GetScannerNumber(&nScannerNumber);
if (nScannerNumber > )
{
   AfxMessageBox(_T("Device is initialized successfully."), , );
}
```

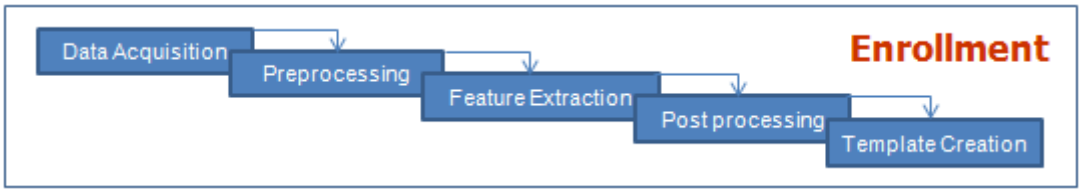
8. Add release code as below at OnClose( ) Message.

```
void CHelloBioMiniDlg::OnClose()
{
   // TODO: Add your message handler code here and/or call default
   UFS_Uninit();
   CDialogEx::OnClose();
}
```

9. Compile Project and copy UFScanner.dll & UFMatcher.dll at $(SolutionDir)Debug\

10. You can check message as below by running HelloBioMini.exe after connecting the device.

3.2 Enrollment Tutorial



- ***An application for people to enroll***:
  - Captures multiple fingerprints for at least two fingers from a fingerprint reader.
  - Checks image quality to ensure that a good quality scan is obtained.
  - Extracts the fingerprint minutiae.
  - Saves the fingerprint images and/or minutiae in a database.

During the enrollment process, one or more fingers are scanned for each person. We recommend that you enroll at least two fingers (more is recommended) because in the event of an accident or injury to one finger, another enrolled finger can be used to identify the individual.

The enrollment application needs to perform the following steps to enroll a single finger from a user:

Workflow

1. Call UFS_Init() to initialize the device for image acquisition.
2. Call UFS_GetScannerHandle() to get the scanner handle
3. Call UFS_Setparameter() to set up the parameters of the scanner
4. Call UFS_SetTemplateType() to set up the type of the template
5. Call UFS_CaptureSingleImage() to start to acquire the fingerprint image
6. Call UFS_Uninit() to uninitialize scanners

Example

1. Preliminaries

```
// Add Suprema UFScanner lib (lib\UFScanner.lib) to the Project.
// Add following statements in the source
#include "UFScanner.h"

// We use 1024 bytes template size in this tutorial.
#define TEMPLATE_SIZE 1024
```

2. Initialize scanner module and check number of scanners

```
UFS_STATUS ufs_res;
int nScannerNumber;

// Initialize scanner module
ufs_res = UFS_Init();
```

```
// Always check status return codes after running SDK functions
// Meaning of status return code can be retrieved using UFS_GetErrorString()
// In the tutorial, we omit error check codes

// Check number of scanners
ufs_res = UFS_GetScannerNumber(&nScannerNumber);
// If number of scanner is under one, that means there is no scanner in this
system
```

3. Get first scanner

```
UFS_STATUS ufs_res;
HUFScanner hScanner;
// Get first scanner handle (0 means first scanner)
ufs_res = UFS_GetScannerHandle(, &hScanner);
```

4. Set parameters

```
// hScanner comes from section 3
UFS_STATUS ufs_res;
int nValue;
// Set timeout for capturing images to 5 seconds
nValue = 5000;
ufs_res = UFS_SetParameter(hScanner, UFS_PARAM_TIMEOUT, &nValue);

// Set template size to 1024 bytes
nValue = MAX_TEMPLATE_SIZE;
ufs_res = UFS_SetParameter(hScanner, UFS_PARAM_TEMPLATE_SIZE, &nValue);

// Set not to detect core when extracting template
nValue = FALSE;
ufs_res = UFS_SetParameter(hScanner, UFS_PARAM_DETECT_CORE, &nValue);
```

5. Capture image and extract template

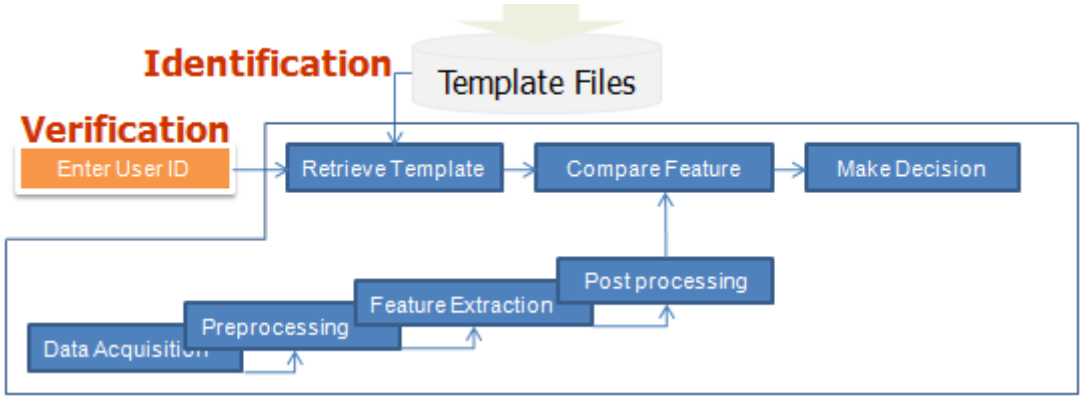
```
// hScanner comes from section 3
UFS_STATUS ufs_res;
unsigned char aTemplate[MAX_TEMPLATE_SIZE];
int nTemplateSize;
int nEnrollQuality;

// Clear capture buffer
ufs_res = UFS_ClearCaptureImageBuffer(hScanner);
// Capture single image
ufs_res = UFS_CaptureSingleImage(hScanner);
// If capturing images is fail, iterate above capture routine or show error
message
```

```
// Extract template from captured image
ufs_res = UFS_ExtractEx(hScanner, MAX_TEMPLATE_SIZE, aTemplate,
&nTemplateSize, &nEnrollQuality);
// If extraction is succeed, check nEnrollQuality is above predefined
quality threshold
```

6. Uninitialize scanner module

```
UFS_STATUS ufs_res;
// Uninitialize scanner module
ufs_res = UFS_Uninit();
```

3.3 Verification Tutorial



- ***Fingerprint recognition involves operation:***
  - **Verifying** - Comparing a fingerprint against a specific user's enrolled fingerprint(s) to verify a specific person's identity (e.g., when the user types their name and then uses a fingerprint rather than a password).

Verification Workflow

1. UFS_Init() to initialize scanners for image acquisition
2. UFS_GetScannerHandle() to get the scanner handle
3. UFS_Setparameter() to set up the parameters of the scanner
4. UFS_SetTemplateType() to set up the type of the template
5. UFS_CaptureSingleImage() to start to acquire the fingerprint image
6. UFS_Extract() to extract the captured image to template
7. UFM_Create() to create a Matcher for matching
8. UFM_Verify() to compare it to a selected template in database
9. UFM_Delete() to close a Matcher
10. UFS_Uninit() to uninitialize scanners

Example

1. Preliminaries

```
// Add Suprema UFMatcher lib (lib\UFMatcher.lib) to the Project
// Add following statements in the source
#include "UFMatcher.h"

// We use 1024 bytes template size in this tutorial
#define MAX_TEMPLATE_SIZE 1024
```

2. Initialize scanner module and check number of scanners

```
UFM_STATUS ufm_res; HUFMatcher hMatcher;
// Create matcher
ufm_res = UFM_Create(&hMatcher);
```

```
// Always check status return codes after running SDK functions
// Meaning of status return code can be retrieved using UFM_GetErrorString()
// In the tutorial, we omit error check codes
```

3. Get first scanner

```
UFS_STATUS ufs_res;
HUFScanner hScanner;

// Get first scanner handle (0 means first scanner)
ufs_res = UFS_GetScannerHandle(, &hScanner);
```

4. Set parameters

```
// hScanner comes from section 3
UFS_STATUS ufs_res;
int value;

// Set timeout for capturing images to 5 seconds
value = 5000;
ufs_res = UFS_SetParameter(hScanner, UFS_PARAM_TIMEOUT, &value);

// Set template size to 1024 bytes
value = MAX_TEMPLATE_SIZE;
ufs_res = UFS_SetParameter(hScanner, UFS_PARAM_TEMPLATE_SIZE, &value);

// Set not to detect core when extracting template
value = FALSE;
ufs_res = UFS_SetParameter(hScanner, UFS_PARAM_DETECT_CORE, &value);
```

5. Capture image and extract template

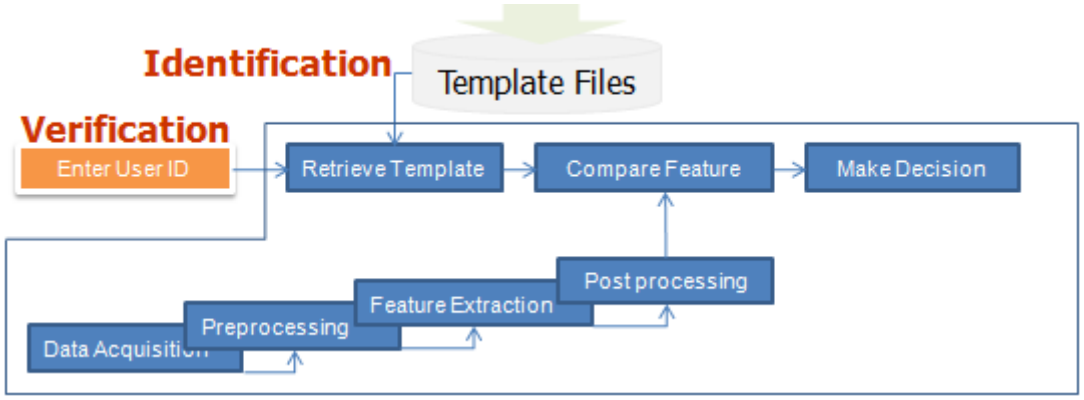
```
// hScanner comes from section 3
UFS_STATUS ufs_res;
byte[] Template = new byte[MAX_TEMPLATE_SIZE];
int TemplateSize;
int EnrollQuality;

// Clear capture buffer
ufs_res = Scanner.ClearCaptureImageBuffer();

// Capture single image
ufs_res = Scanner.CaptureSingleImage();
// If capturing images is fail, iterate above capture routine or show error
message

// Extract template from captured image
```

```
ufs_res = Scanner.ExtractEx(MAX_TEMPLATE_SIZE, Template, out TemplateSize,
out EnrollQuality);
// If extraction is succeed, check nEnrollQuality is above predefined
quality threshold
```

6. Uninitialize scanner module

```
UFS_STATUS ufs_res;

// Uninitialize scanner module
ufs_res = UFS_Uninit();
```

3.4 Identification Tutorial



- ***Fingerprint recognition involves operation***:
  - **Identification** - Comparing a fingerprint against the database of enrolled fingerprints and confirming that the fingerprint is enrolled (e.g., to open a door there many be many authorized users).

Identification Workflow

1. UFS_Init() to initialize scanners for image acquisition
2. UFS_GetScannerHandle() to get the scanner handle
3. UFS_Setparameter() to set up the parameters of the scanner
4. UFS_SetTemplateType() to set up the template type
5. UFS_CaptureSingleImage() to start to acquire the fingerprint image
6. UFS_Extract() to extract the captured image to template
7. UFM_Create() to create a Matcher for matching
8. UFM_Identify() to compare it to N number of templates in database
9. UFM_Delete() to close a Matcher
10. UFS_Uninit() to uninitialize scanners

Example

1. Preliminaries

```
// Add Suprema UFMatcher lib (lib\UFMatcher.lib) to the Project
// Add following statements in the source
#include "UFMatcher.h"

// We use 1024 bytes template size in this tutorial
#define MAX_TEMPLATE_SIZE 1024
// Set maximum template number to 50 (number depends on application)
#define MAX_TEMPLATE_NUM 50
```

2. Create matcher

```
UFM_STATUS ufm_res;
```

```
HUFMatcher hMatcher;

// Create matcher
ufm_res = UFM_Create(&hMatcher);

// Always check status return codes after running SDK functions
// Meaning of status return code can be retrieved using UFM_GetErrorString()
// In the tutorial, we omit error check codes
```

3. Set parameters

```
// hMatcher comes from section 2
UFM_STATUS ufm_res;
int value;

// Set security level to 4
value = 4;
ufm_res = UFM_SetParameter(hMatcher, UFM_PARAM_SECURITY_LEVEL, &value);

// Set fast mode on
value = TRUE;
ufm_res = UFM_SetParameter(hMatcher, UFM_PARAM_FAST_MODE, &value);
```

4. Identify

```
// hMatcher comes from section 2
UFM_STATUS ufm_res;
unsigned char Template1[MAX_TEMPLATE_SIZE];
int Template1Size;
unsigned char* Template2Array[MAX_TEMPLATE_NUM];
int Template2SizeArray[MAX_TEMPLATE_NUM];
int Template2Num;
int nMatchIndex;

// Allocate Template2Array
for (i = ; i < MAX_TEMPLATE_NUM; i++)
{
   Template2Array[i] = (unsigned
   char*)malloc(MAX_TEMPLATE_SIZE);
   memset(Template2Array[i], , MAX_TEMPLATE_SIZE);
}

// Get Template1 from scanner or image or database
// Get Template2Array from scanner or image or database

// Identify Template1 from Template2Array, set timeout to 5
seconds
ufm_res = UFM_Identify(hMatcher, Template1, Template1Size, Template2Array,
Template2SizeArray, Template2Num, 5000, &nMatchIndex);
```

```
if (ufm_res != UFM_OK)
{
   // Execute error handling codes
}
else
{
   if (nMatchIndex != -1)
   {
      // Identification succeed
   }
   else
   {
      // Identification failed
   }
}

// Free Template2Array
for (i = ; i < MAX_TEMPLATE_NUM; i++)
{
   free(Template2Array[i]);
}
```

5. Delete matcher

```
// hMatcher comes from section 2
UFM_STATUS ufm_res;

// Delete matcher
ufm_res = UFM_Delete(&hMatcher);
```

3.5 C/C++ APIs

Below are instructions of the C++ APIs. You can find the detailed information of the C++ APIs in a header file. This defines the class and structure of the data that are necessary to use the functions. All header files are located in <SDK_HOME>\include folder.

UFS_Init()
: Initializes a UFScanner module

UFS_Update()
: Enforces a UFScanner module to update the connection state of scanners

UFS_Uninit()
: Un-initializes a UFScanner module

UFS_SetScannerCallback()
: Registers a scanner callback function

UFS_RemoveScannerCallback()
: Removes a registered scanner callback function

UFS_GetScannerNumber()
: Gets the number of scanners

UFS_GetScannerHandle()
: Gets the scanner handle using the scanner index

UFS_GetScannerHandleByID()
: Gets the scanner handle using a scanner ID

UFS_GetScannerIndex()
: Gets the scanner index that is assigned to the scanner handle

UFS_GetScannerID()
: Gets a scanner ID that is assigned to the scanner handle

UFS_GetScannerType()
: Gets the scanner type that is assigned to the scanner handle

UFS_GetParameter()
: Gets the parameter value of a UFScanner module

UFS_SetParameter()
: Sets the parameter value of a UFScanner module

UFS_IsSensorOn()
: Checks whether a scanner is connected or not

UFS_IsFingerOn()
: Checks whether a finger is placed on a scanner or not

UFS_CaptureSingleImage()
: Captures single image. Captured image is stored to the internal buffer

UFS_StartCapturing()
: Starts capturing. The capture is going on until the specified time exceeds

UFS_StartAutoCapture()
: Starts the automatic capture. Currently this function is working for Suprema SFR600(BioMini Slim) only

UFS_IsCapturing()
: Checks if the specified scanner is running to capture which is started by UFS_CaptureSingleImage or UFS_StartCapturing

UFS_AbortCapturing()
: Aborts capturing which is started by UFS_CaptureSingleImage or UFS_StartCapturing

UFS_Extract()
: Extracts a template from the stored image buffer which is acquired using UFS_CaptureSingleImage() or UFS_StartCapturing()

UFS_ExtractEx()
: Extracts a template from the stored image buffer which is acquired using UFS_CaptureSingleImage() or UFS_StartCapturing().This is extended version of UFS_Extract function to accommodate a template with large size

UFS_SetEncryptionKey()
: Sets the encryption key

UFS_EncryptTemplate()
: Encrypts a template

UFS_DecryptTemplate()
: Decrypts a template

UFS_GetCaptureImageBufferInfo()
: Gets the information of the capture image buffer

UFS_GetCaptureImageBuffer()
: Copies the capture image buffer to the specified image data array

UFS_GetCaptureImageBufferToBMPImageBuffer()
: Copies the capture image buffer to the specified image data of bmp format

UFS_GetCaptureImageBufferTo19794_4ImageBuffer()

Copies the capture image buffer to the specified image data of 19794_4 format

UFS_GetCaptureImageBufferToWSQImageBuffer()
Copies the capture image buffer to the specified image data of the WSQ format

UFS_GetCaptureImageBufferToWSQImageBufferVar()
Copies the capture image buffer (cropped or expanded to the specified size) to the target image data buffer of the WSQ format

UFS_DecompressWSQBMP()
Decompress a WSQ file and save to a BMP file

UFS_DecompressWSQBMPMem()
Decompress a WSQ buffer and save to the image data of the bmp format

UFS_DrawCaptureImageBuffer()
Draws the fingerprint image which is acquired using UFS_CaptureSingleImage() or UFS_StartCapturing(). This function is not supported on java

UFS_DrawFeatureBuffer()
Draws the fingerprint image which is acquired using UFS_CaptureSingleImage() or UFS_StartCapturing(). This function is not supported on java And should be called after the extraction from the last captured fingerprint image. If extraction is not performed from the last captured image, this function will not draw the feature in the image frame

UFS_SaveCaptureImageBufferToBMP()
Saves the capture image buffer to the specified file of the bitmap format

UFS_SaveCaptureImageBufferTo19794_4()
Saves the capture image buffer to the specified file of the 19794_4 format

UFS_SaveCaptureImageBufferToWSQ()
Saves the capture image buffer to the specified file of the WSQ format

UFS_SaveCaptureImageBufferToWSQVar()
Saves the capture image buffer (cropped or expanded to the specified size) to the target file of the WSQ format

UFS_ClearCaptureImageBuffer()
Clears the capture image buffer stored to the internal buffer

UFS_GetErrorString()
Gets the error string for specified UFS_STAUS value

UFS_GetTemplateType()
Gets the template type value

UFS_SetTemplateType()
Sets the template type value

UFS_SelectTemplate()

Selects n number of good templates from m number of input templates

UFS_SelectTemplateEx()
: Selects n number of good templates from m number of input templates This is extended version of UFS_SelectTemplate function to accommodate the template with large size

UFS_GetFPQuality()
: Calculates the quality score of an image as defined in NISTIR 7151: FingerPrint Image Quality. The score would be between 1(excellent) and 5(poor)

UFS_GetFeatureNumber()
: Get number of Minutiae from template data

UFS_EnrollUI()
: Generates the fingerprint enrollment dialog. This function can be called after executing UFS_Init(). Enrolling a fingerprint is extracting a template from finger and saving the template. Below sample's UFS_EnrollUI() captures a fingerprint image after setting the template type. And extracts a template from captured fingerprint image. The extracted template will be saved in a specific template array, which is a parameter of the UFS_EnrollUI(). It supported only for Windows environment

UFS_VerifyUI()
: Generates the fingerprint verification dialog. This function can be called after executing UFS_Init() and UFS_EnrollUI(). Two fingerprints can be verified whether they are matched or not. Below sample's UFS_VerifyUI() captures a fingerprint image and extracts a template from the image. And execute 1:1 matching using extracted template and templates enrolled from UFS_EnrollUI()

UFS_CapturesingleUI()
: Performs same as UFS_CaptureSingle and Popup Window appears once the capturing starts to show captured image then disappears.

UFM_Create()
: Creates a matcher object

UFM_Delete()
: Deletes a specified matcher object

UFM_GetParameter()
: Gets the parameter value of UFMatcher module

UFM_SetParameter()
: Sets the parameter value of UFMatcher module

UFM_Verify()
: Compares two extracted templates

UFM_VerifyEx()
: Performs same as UFM_Verify, and returns matching score by 6th parameter (matching score in between 0~1, idle match as the score is close to 1)

UFM_Identify(),IdentifyMT()
: Compares a template with given template array UFM_IdentifyMT function uses multi threads internally for faster identifying in multi-core systems

UFM_AbortIdentify()
: Aborts current identifying procedure started using UFM_Identify()

UFM_IdentifyInit()
: Initializes identify with input template

UFM_IdentifyNext()
: Matches one input template to the template specified in UFM_IdentifyInit()

UFM_RotateTemplate()
: Rotates the specified template to the amount of 180 degrees

UFM_GetErrorString()
: Gets the error string for the specified UFM_STAUS value

UFM_GetTemplateType()
: Gets the parameter value

UFM_SetTemplateType()
: Sets the parameter value

UFS_Init

Initializes a UFScanner module.

```
UFS_STATUS UFS_API UFS_Init();
```

Examples

```
UFS_STATUS ufs_res;
int nScannerNumber;

ufs_res = UFS_GetScannerNumber(&nScannerNumber);
if (ufs_res == UFS_OK)
{
   // UFS_GetScannerNumber is succeeded
}
else
{
   // UFS_GetScannerNumber is failed
   // Use UFS_GetErrorString function to show error string
}
```

Return Values(refer to return values)

UFS_Update

Enforces a UFScanner module to update the connection state of scanners.

```
UFS_STATUS UFS_API UFS_Update();
```

Examples

```
UFS_STATUS ufs_res;
ufs_res = UFS_Update();
if (ufs_res == UFS_OK)
{
   // UFS_Init is succeeded
}
else
{
   // UFS_Init is failed
   // Use UFS_GetErrorString function to show error string
}
```

Return Values(refer to return values)

UFS_Uninit

Un-initializes a UFScanner module.

```
UFS_STATUS UFS_API UFS_Uninit();
```

Examples

```
UFS_STATUS ufs_res;

ufs_res = UFS_Uninit();
if (ufs_res == UFS_OK)
{
   // UFS_Init is succeeded
}
else
{
   // UFS_Init is failed
   // Use UFS_GetErrorString function to show error string
}
```

Return Values(refer to return values)

UFS_SetScannerCallback

Registers the scanner callback function.

```
UFS_STATUS UFS_API UFS_SetScannerCallback(
      UFS_SCANNER_PROC* pScannerProc,
      void* pParam );
```

Parameters

- *pScannerProc [in]* : Handle to the UFS_SCANNER_PROC function which receives scanner events
- *pParam [in]* : Pointer to the scanner callback data which will be transmitted with a scanner callback event

Examples

```
UFS_STATUS ufs_res;

ufs_res = UFS_Uninit();
if (ufs_res == UFS_OK)
{
   // UFS_Init is succeeded
}
else
{
   // UFS_Init is failed
   // Use UFS_GetErrorString function to show error string
}
```

Return Values(refer to return values)

UFS_RemoveScannerCallback

Removes the registered scanner callback function.

```
UFS_STATUS UFS_API UFS_RemoveScannerCallback();
```

Examples

```
UFS_STATUS ufs_res;

ufs_res = UFS_RemoveScannerCallback();
if (ufs_res == UFS_OK)
{
   // UFS_RemoveScannerCallback is succeeded
}
else
{
   // UFS_RemoveScannerCallback is failed
   // Use UFS_GetErrorString function to show error string
}
```

Return Values(refer to return values)

UFS_GetScannerNumber

Gets the number of scanners.

```
UFS_STATUS UFS_API UFS_GetScannerNumber(
      int* pnScannerNumber);
```

Parameters

- *pnScannerNumber [out]* : Receive the number of scanners

Examples

```
UFS_STATUS ufs_res;
int nScannerNumber;

ufs_res = UFS_GetScannerNumber(&nScannerNumber);
if (ufs_res == UFS_OK)
{
   // UFS_GetScannerNumber is succeeded
}
else
{
   // UFS_GetScannerNumber is failed
   // Use UFS_GetErrorString function to show error string
}
```

Return Values(refer to return values)

UFS_GetScannerHandle

Gets the scanner handle using a scanner index.

```
UFS_STATUS UFS_API UFS_GetScannerHandle(
      int nScannerIndex,
      HUFScanner* phScanner );
```

Parameters

- *nScannerIndex [in]* : Scanner index (0 ~ number of scanners - 1)
- *phScanner [out]* : Pointer to handle of the scanner object

Examples

```
UFS_STATUS ufs_res;
int nScannerIndex;
HUFScanner hScanner;

// Set nScannerIndex to (0 ~ number of scanners - 1 )
// Number of scanner can be retrieved using UFS_GetScannerNumber function

ufs_res = UFS_GetScannerHandle(nScannerIndex, &hScanner);
if (ufs_res == UFS_OK)
{
   // UFS_GetScannerHandle is succeeded
}
else
{
   // UFS_GetScannerHandle is failed
   // Use UFS_GetErrorString function to show error string
}
```

Return Values(refer to return values)

UFS_GetScannerHandleByID

Gets the scanner handle using a scanner ID.

```
UFS_STATUS UFS_API UFS_GetScannerHandleByID(
      const char* szScannerID,
      HUFScanner* phScanner );
```

Parameters

- *szScannerID [in]* : Scanner ID
- *phScanner [out]* : Pointer to handle of the scanner object

Examples

```
UFS_STATUS ufs_res;
char strID[64];
HUFScanner hScanner;
// Assign scanner ID to strID
// Scanner ID can be retrieved using UFS_GetScannerID function

ufs_res = UFS_GetScannerHandleByID(strID, &hScanner);
if (ufs_res == UFS_OK)
{
   // UFS_GetScannerHandleByID is succeeded
}
else
{
   // UFS_GetScannerHandleByID is failed
   // Use UFS_GetErrorString function to show error string
}
```

Return Values(refer to return values)

UFS_GetScannerIndex

Gets a scanner index that is assigned to the scanner handle.

```
UFS_STATUS UFS_API UFS_GetScannerIndex(
      HUFScanner hScanner,
      int* pnScannerIndex );
```

Parameters

- *hScanner [in]* : Handle to the scanner object
- *pnScannerIndex [out]* : Receive scanner index of specified scanner handle

Examples

```
UFS_STATUS ufs_res;
HUFScaner hScanner;
int nScannerIndex;
// Get hScanner handle

ufs_res = UFS_GetScannerIndex(hScanner, &nScannerIndex);
if (ufs_res == UFS_OK)
{
   // UFS_GetScannerIndex is succeeded
}
else
{
   // UFS_GetScannerIndex is failed
   // Use UFS_GetErrorString function to show error string
}
```

Return Values(refer to return values)

UFS_GetScannerID

Gets scanner ID assigned to scanner handle.

```
UFS_STATUS UFS_API UFS_GetScannerID(
      HUFScanner hScanner,
      char* szScannerID );
```

Parameters

- *hScanner [in]* : Handle to the scanner object
- *szScannerID [out]* : Receive scanner ID of specified scanner handle; Scanner ID has maximum 32 characters. szScannerID must be allocated in user's applications and allocated size must be larger than 33 bytes for considering null character in 33th byte position.

Examples

```
UFS_STATUS ufs_res;
HUFScanner hScanner;

char strID[64];
// Should be larger than 33 bytes
// Get hScanner handle

ufs_res = UFS_GetScannerID(hScanner, strID);
if (ufs_res == UFS_OK)
{
   // UFS_GetScannerID is succeeded
}
else
{
   // UFS_GetScannerID is failed
   // Use UFS_GetErrorString function to show error string
}
```

Return Values(refer to return values)

UFS_GetScannerType

Gets the scanner type that is assigned to the scanner handle.

```
UFS_STATUS UFS_API UFS_GetScannerType(
      HUFScanner hScanner,
      int* pnScannerType );
```

Parameters

- *hScanner [in]* : Handle to the scanner object
- *pnScannerType [out]* : Receives one of the scanner type

Scanner type	Code	Description
UFS_SCANNER_TYPE_SFR200	1001	Suprema SFR200
UFS_SCANNER_TYPE_SFR300	1002	Suprema SFR300-S
UFS_SCANNER_TYPE_SFR300v2	1003	Suprema SFR300v2, SFR400
UFS_SCANNER_TYPE_SFR500	1004	Suprema SFR500
UFS_SCANNER_TYPE_SFR600	1005	Suprema SFR600
UFS_SCANNER_TYPE_SFR410	1006	Suprema SFR410
UFS_SCANNER_TYPE_SFR550	1007	Suprema SFR550

Examples

```
UFS_STATUS ufs_res;
HUFScaner hScanner;
int nScannerType;
// Get hScanner handle

ufs_res = UFS_GetScannerType(hScanner, &nScannerType);
if (ufs_res == UFS_OK)
{
   // UFS_GetScannerType is succeeded
}
else
{
   // UFS_GetScannerType is failed
   // Use UFS_GetErrorString function to show error string
}
```

Return Values(refer to return values)

UFS_GetParameter

Gets parameter value of UFScanner module.

```
UFS_STATUS UFS_API UFS_GetParameter(
      HUFScanner hScanner,
      int nParam,
      void* pValue );
```

Parameters

- *hScanner [in]* : Handle to the scanner object
- *nParam [in]* : Parameter type; one of parameters

Parameter	Code	Description	Default value
UFS_PARAM_TIMEOUT	201	Timeout (millisecond unit) (0: infinite)	5000
UFS_PARAM_BRIGHTNESS	202	Brightness (0 ~ 255); Higher value means darker image. * Not supported Device: BioMini-Slim(SFU-S20, SFU-S20B) BioMini(SFU-300)	100
UFS_PARAM_SENSITIVITY	203	Sensitivity (0 ~ 7); Higher value means more sensitive	4
UFS_PARAM_SERIAL	204	Serial (get only)	-
UFS_PARAM_SDK_VERSION	210	SDK Version (get only)	
UFS_PARAM_SDK_COPYRIGHT	211	SDK Copyright (get only)	
UFS_PARAM_DETECT_CORE	301	Detect core (0: not use core, 1: use core)	0
UFS_PARAM_TEMPLATE_SIZE	302	Template size (byte unit) (256 ~ 1024, 32 bytes step size)	1024
UFS_PARAM_USE_SIF	311	Use SIF (0: not use SIF, 1: use SIF)	0
UFS_PARAM_DETECT_FAKE	312	Use live Finger Detection (0: not use LFD, 1 ~3 : use LFD); Higher value means more strong to fake finger * Supported Device: BioMini Slim(SFU-S20, SFU-S20B)	0

- *pValue [out]* : Receives parameter value of specified parameter type; pValue must point to adequate storage type matched to parameter type

Examples

```
UFS_STATUS ufs_res;
HUFScaner hScanner;

int nValue;
char strSerial[64];
char strSdkVer[64];
char copyright[64];

// Get hScanner handle

// Get timeout
ufs_res = UFS_GetParameter(hScanner, UFS_PARAM_TIMEOUT, &nValue);
// Error handling routine is omitted
```

```
// Get brightness
ufs_res = UFS_GetParameter(hScanner, UFS_PARAM_BRIGHTNESS, &nValue);
// Error handling routine is omitted

// Get sensitivity
ufs_res = UFS_GetParameter(hScanner, UFS_PARAM_SENSITIVITY, &nValue);
// Error handling routine is omitted

// Get serial
ufs_res = UFS_GetParameter(hScanner, UFS_PARAM_SERIAL, strSerial);
// Error handling routine is omitted

// Get SDK version
ufs_res = UFS_GetParameter(hScanner, UFS_PARAM_SDK_VERSION, strSdkVer);
// Error handling routine is omitted

// Get SDK copyright
ufs_res = UFS_GetParameter(hScanner, UFS_PARAM_SDK_COPYRIGHT, copyright);
// Error handling routine is omitted

// Get detect core
ufs_res = UFS_GetParameter(hScanner, UFS_PARAM_DETECT_CORE, &nValue);
// Error handling routine is omitted

// Get template size
ufs_res = UFS_GetParameter(hScanner, UFS_PARAM_TEMPLATE_SIZE, &nValue);
// Error handling routine is omitted

// Get use SIF
ufs_res = UFS_GetParameter(hScanner, UFS_PARAM_USE_SIF, &nValue);
// Error handling routine is omitted
```

Return Values(refer to return values)

UFS_SetParameter

Sets parameter value of UFScanner module.

```
UFS_STATUS UFS_API UFS_SetParameter(
      HUFScanner hScanner,
      int nParam,
      void* pValue );
```

Parameters

- *hScanner [in]* : Handle to the scanner object
- *nParam [in]* : Parameter type; one of parameters

Parameter	Code	Description	Default value
UFS_PARAM_TIMEOUT	201	Timeout (millisecond unit) (0: infinite)	5000
UFS_PARAM_BRIGHTNESS	202	Brightness (0 ~ 255); Higher value means darker image. * Not supported Device: BioMini-Slim(SFU-S20, SFU-S20B) BioMini(SFU-300)	100
UFS_PARAM_SENSITIVITY	203	Sensitivity (0 ~ 7); Higher value means more sensitive	4
UFS_PARAM_SERIAL	204	Serial (get only)	-
UFS_PARAM_SDK_VERSION	210	SDK Version (get only)	
UFS_PARAM_SDK_COPYRIGHT	211	SDK Copyright (get only)	
UFS_PARAM_DETECT_CORE	301	Detect core (0: not use core, 1: use core)	0
UFS_PARAM_TEMPLATE_SIZE	302	Template size (byte unit) (256 ~ 1024, 32 bytes step size)	1024
UFS_PARAM_USE_SIF	311	Use SIF (0: not use SIF, 1: use SIF)	0
UFS_PARAM_DETECT_FAKE	312	Use live Finger Detection (0: not use LFD, 1 ~3 : use LFD); Higher value means more strong to fake finger * Supported Device: BioMini Slim(SFU-S20, SFU-S20B)	0

- *pValue [in]* : Pointer to parameter value of specified parameter type; pValue must point to adequate storage type matched to parameter type

Examples

```
UFS_STATUS ufs_res;
HUFScaner hScanner;

int nValue;

// Get hScanner handle

// Set timeout to nValue
ufs_res = UFS_SetParameter(hScanner, UFS_PARAM_TIMEOUT, &nValue);
// Error handling routine is omitted

// Set brightness to nValue
ufs_res = UFS_SetParameter(hScanner, UFS_PARAM_BRIGHTNESS, &nValue);
// Error handling routine is omitted
```

```
// Set sensitivity to nValue
ufs_res = UFS_SetParameter(hScanner, UFS_PARAM_SENSITIVITY, &nValue);
// Error handling routine is omitted

// Set detect core to nValue
ufs_res = UFS_SetParameter(hScanner, UFS_PARAM_DETECT_CORE, &nValue);
// Error handling routine is omitted

// Set template size to nValue
ufs_res = UFS_SetParameter(hScanner, UFS_PARAM_TEMPLATE_SIZE, &nValue);
// Error handling routine is omitted

// Set use SIF to nValue
ufs_res = UFS_SetParameter(hScanner, UFS_PARAM_USE_SIF, &nValue);
// Error handling routine is omitted
```

Return Values(refer to return values)

UFS_IsSensorOn

Checks whether a scanner is connected or not.

```
UFS_STATUS UFS_API UFS_IsSensorOn(
      HUFScanner hScanner,
      int* pbSensorOn );
```

Parameters

- *hScanner [in]* : Handle to the scanner object
- *pbSensorOn [out]* : Receive the status of specified scanner object; 1: the scanner is connected, 0: the scanner is disconnected

Examples

```
UFS_STATUS ufs_res;
HUFScaner hScanner;
int bSensorOn;
// Get hScanner handle

ufs_res = UFS_IsSensorOn(hScanner, &bSensorOn);
if (ufs_res == UFS_OK)
{
   // UFS_IsSensorOn is succeeded
}
else
{
   // UFS_IsSensorOn is failed
   // Use UFS_GetErrorString function to show error string
}
```

Return Values(refer to return values)

UFS_IsFingerOn

Checks whether a finger is placed on a scanner or not.

```
UFS_STATUS UFS_API UFS_IsFingerOn(
      HUFScanner hScanner,
      int* pbFingerOn );
```

Parameters

- *hScanner [in]* : Handle to the scanner object
- *pbFingerOn [out]* : Checks if a finger is placed on the specified scanner; 1: a finger is on the scanner, 0: a finger is not on the scanner

Examples

```
UFS_STATUS ufs_res;
HUFScaner hScanner;

int bFingerOn;

// Get hScanner handle

ufs_res = UFS_IsFingerOn(hScanner, &bFingerOn);

if (ufs_res == UFS_OK)
{
   // UFS_IsFingerOn is succeeded
}
else
{
   // UFS_IsFingerOn is failed
   // Use UFS_GetErrorString function to show error string
}
```

Return Values(refer to return values)

UFS_CaptureSingleImage

Captures single image. Captured image is stored to the internal buffer.

```
UFS_STATUS UFS_API UFS_CaptureSingleImage(
      HUFScanner hScanner, );
```

Parameters

- *hScanner [in]* : Handle to the scanner object

Examples

```
UFS_STATUS ufs_res;
HUFScaner hScanner;

// Get hScanner handle

ufs_res = UFS_CaptureSingleImage(hScanner);

if (ufs_res == UFS_OK)
{
   // UFS_CaptureSingleImage is succeeded
}
else
{
   // UFS_CaptureSingleImage is failed
   // Use UFS_GetErrorString function to show error string
}
```

Return Values(refer to return values)

UFS_StartCapturing

Starts capturing. The capture is going on until the specified time exceeds.

```
UFS_STATUS UFS_API UFS_StartCapturing(
      HUFScanner hScanner,
      UFS_CAPTURE_PROC* pCaptureProc,
      void* pParam );
```

Parameters

- *hScanner [in]* : Handle to the scanner object
- *pCaptureProc [in]* : Handle to the UFS_CAPTURE_PROC function which receives capture events
- *pParam [in]* : Pointer to the capture callback data which will be transmitted with a capture callback event

Examples

```
// Define capture procedure
int UFS_CALLBACK CaptureProc(HUFScanner hScanner, int bFingerOn, unsigned
char* pImage, int nWidth, int nHeight, int nResolution, void* pParam)
{
   // ...
}

UFS_STATUS ufs_res;
HUFScaner hScanner;
void* pParam;

// Get hScanner handle

// Assign pParam, for example, application data

ufs_res = UFS_StartCapturing(hScanner, CaptureProc, pParam);

if (ufs_res == UFS_OK)
{
   // UFS_StartCapturing is succeeded
}
else
{
   // UFS_StartCapturing is failed
   // Use UFS_GetErrorString function to show error string
}
```

Return Values(refer to return values)

UFS_StartAutoCapture

Starts the automatic capture. Currently this function is working for Suprema SFR600(BioMini Slim) only.

```
UFS_STATUS UFS_API UFS_StartAutoCapture(
      HUFScanner hScanner,
      UFS_CAPTURE_PROC* pCaptureProc,
      void* pParam );
```

Parameters

- *hScanner [in]* : Handle to the scanner object
- *pCaptureProc [in]* : Handle to the UFS_CAPTURE_PROC function which receives capture events
- *pParam [in]* : Pointer to the capture callback data which will be transmitted with a capture callback event

Examples

```
// Define capture procedure
int UFS_CALLBACK CaptureProc(HUFScanner hScanner, int bFingerOn, unsigned
char* pImage, int nWidth, int nHeight, int nResolution, void* pParam)
{
   // ...
}

UFS_STATUS ufs_res;
HUFScaner hScanner;
void* pParam;

// Get hScanner handle

// Assign pParam, for example, application data

ufs_res = UFS_StartAutoCapture(hScanner, CaptureProc, pParam);
if (ufs_res == UFS_OK)
{
   // UFS_StartAutoCapture is succeeded
}
else
{
   // UFS_StartAutoCapture is failed
   // Use UFS_GetErrorString function to show error string
}
```

Return Values(refer to return values)

UFS_IsCapturing

Checks if the specified scanner is running to capture which is started by UFS_CaptureSingleImage or UFS_StartCapturing

```
UFS_STATUS UFS_API UFS_IsCapturing(
      HUFScanner hScanner,
      int* pbCapturing );
```

Parameters

- *hScanner [in]* : Handle to the scanner object
- *pbCapturing [out]* : Checks if the specified scanner is running capturing; 1: the capture is running, 0: the capture is not running

Examples

```
UFS_STATUS ufs_res;
HUFScaner hScanner;
int bCapturing;

// Get hScanner handle

ufs_res = UFS_IsCapturing(hScanner, &bCapturing);
if (ufs_res == UFS_OK)
{
   //UFS_IsCapturing is succeeded
}
else
{
   // UFS_IsCapturing is failed
   // Use UFS_GetErrorString function to show error string
}
```

Return Values(refer to return values)

UFS_AbortCapturing

Aborts capturing which is started by UFS_CaptureSingleImage or UFS_StartCapturing.

```
UFS_STATUS UFS_API UFS_AbortCapturing(
      HUFScanner hScanner, );
```

Parameters

- *hScanner [in]* : Handle to the scanner object

Examples

```
UFS_STATUS ufs_res;
HUFScaner hScanner;

// Get hScanner handle

// Start capturing

ufs_res = UFS_AbortCapturing(hScanner);
if (ufs_res == UFS_OK)
{
   // UFS_AbortCapturing is succeeded
}
else
{
   // UFS_AbortCapturing is failed
   // Use UFS_GetErrorString function to show error string
}
```

Return Values(refer to return values)

UFS_Extract

Extracts a template from the stored image buffer which is acquired using UFS_CaptureSingleImage or UFS_StartCapturing.

```
UFS_STATUS UFS_API UFS_Extract(
      HUFScanner hScanner,
      unsigned char* pTemplate,
      int* pnTemplateSize,
      int* pnEnrollQuality);
```

Parameters

- *hScanner [in]* : Handle to the scanner object
- *pTemplate [out]* : Pointer to the template array; The array must be allocated in advance
- *pnTemplateSize [out]* : Receives the size (in bytes) of pTemplate
- *pnEnrollQuality [out]* : Receives the quality of enrollment; Quality value ranges from 1 to 100. Typically this value should be above 30 for further processing such as enroll and matching. Especially in case of enrollment, the use of good quality image (above 50) is highly recommended.

Examples

```
// Template size can be controlled by using UFS_SetParameter function
// Default value is 1024 bytes
#define MAX_TEMPLATE_SIZE 1024

UFS_STATUS ufs_res;
HUFScaner hScanner;

unsigned char Template[MAX_TEMPLATE_SIZE];
int TemplateSize;
int nEnrollQuality;

// Get hScanner handle

ufs_res = UFS_Extract(hScanner, Template, &TemplateSize, &nEnrollQuality);
if (ufs_res == UFS_OK)
{
   // UFS_Extract is succeeded
}
else
{
   // UFS_Extract is failed
   // Use UFS_GetErrorString function to show error string
}
```

Return Values(refer to return values)

UFS_ExtractEx

Extracts a template from the stored image buffer which is acquired using UFS_CaptureSingleImage or UFS_StartCapturing. This is extended version of UFS_Extract function to accommodate large size template.

```
UFS_STATUS UFS_API UFS_ExtractEx(
      HUFScanner hScanner,
      int* nBufferSize,
      unsigned char* pTemplate,
      int* pnTemplateSize,
      int* pnEnrollQuality);
```

Parameters

- *hScanner [in]* : Handle to the scanner object
- *nBufferSize [in]* : Template buffer size
- *pTemplate [out]* : Pointer to the template array; The array must be allocated in advance
- *pnTemplateSize [out]* : Receives the size (in bytes) of pTemplate
- *pnEnrollQuality [out]* : Receives the quality of enrollment; Quality value ranges from 1 to 100. Typically this value should be above 30 for further processing such as enroll and matching. Especially in case of enrollment, the use of good quality image (above 50) is highly recommended.

Examples

```
// Template size can be controlled by using UFS_SetParameter function
// Default value is 1024 bytes
#define MAX_TEMPLATE_SIZE 1024

UFS_STATUS ufs_res;
HUFScaner hScanner;

unsigned char Template[MAX_TEMPLATE_SIZE];
int TemplateSize;
int nEnrollQuality;

// Get hScanner handle

ufs_res = UFS_ExtractEx(hScanner, MAX_TEMPLATE_SIZE, Template,
&TemplateSize, &nEnrollQuality);
if (ufs_res == UFS_OK)
{
   // UFS_ExtractEx is succeeded
}
else
{
   // UFS_ExtractEx is failed
```

```
    // Use UFS_GetErrorString function to show error string
}
```

Return Values(refer to return values)

UFS_SetEncryptionKey

Sets encryption key.

```
UFS_STATUS UFS_API UFS_SetEncryptionKey(
      HUFScanner hScanner,
      unsigned char* pKey );
```

Parameters

- *hScanner [in]* : Handle to the scanner object
- *pKey[out]* : Pointer to the 32 bytes key array; default key is first byte is 1 and second to 32th byte are all 0

Examples

```
UFS_STATUS ufs_res;
HUFScaner hScanner;

unsigned char UserKey[32];

// Get hScanner handle
// Generate 32 byte encryption key to UserKey

ufs_res = UFS_SetEncryptionKey(hScanner, UserKey);
if (ufs_res == UFS_OK)
{
   // UFS_SetEncryptionKey is succeeded
}
else
{
   // UFS_SetEncryptionKey is failed
   // Use UFS_GetErrorString function to show error string
}
```

Return Values(refer to return values)

UFS_EncryptTemplate

Encrypts template.

```
UFS_STATUS UFS_API UFS_EncryptTemplate(
      HUFScanner hScanner,
      unsigned char* pTemplateInput,
      int nTemplateInputSize,
      unsigned char* pTemplateOutput,
      int* pnTemplateOutputSize);
```

Parameters

- *hScanner [in]* : Handle to the scanner object
- *pTemplate [in]* : Pointer to input template data
- *nTemplateInputSize [in]* : Input template size
- *pTemplateOutput [out]* : Pointer to encrypted template data
- *pnTemplateOutputSize [in / out]* : Inputs allocated size of encrypted template data; Receives output template size

Examples

```
// Assume template size is 384 bytes
#define MAX_TEMPLATE_SIZE 384

UFS_STATUS ufs_res;
HUFScaner hScanner;
unsigned char TemplateInput[MAX_TEMPLATE_SIZE];
unsigned char TemplateOutput[MAX_TEMPLATE_SIZE];
int TemplateInputSize;
int TemplateOutputSize;

// Get hScanner handle
// Get an input template to encrypt, TemplateInput and TemplateInputSize
// Set output template buffer size TemplateoutputSize = MAX_TEMPLATE_SIZE;

ufs_res = UFS_EncryptTemplate(hScanner, TemplateInput, TemplateInputSize,
TemplateOutput, &TemplateOutputSize);
if (ufs_res == UFS_OK)
{
   // UFS_EncryptTemplate is succeeded
}
else
{
   // UFS_EncryptTemplate is failed
   // Use UFS_GetErrorString function to show error string
}
```

Return Values(refer to return values)

UFS_DecryptTemplate

Decrypts template.

```
UFS_STATUS UFS_API UFS_DecryptTemplate(
      HUFScanner hScanner,
      unsigned char* pTemplateInput,
      int nTemplateInputSize,
      unsigned char* pTemplateOutput,
      int* pnTemplateOutputSize);
```

Parameters

- *hScanner [in]* : Handle to the scanner object
- *pTemplateInput [in]* : Pointer to input template data(encrypted)
- *nTemplateInputSize [in]* : Input template size
- *pTemplateOutput [out]* : Pointer to output template data
- *pnTemplateOutputSize [in / out]* : Inputs allocated size of output template data; Receives output template size

Examples

```
// Assume template size is 384 bytes
#define MAX_TEMPLATE_SIZE 384

UFS_STATUS ufs_res;
HUFScaner hScanner;

unsigned char TemplateInput[MAX_TEMPLATE_SIZE];
unsigned char TemplateOutput[MAX_TEMPLATE_SIZE];
int TemplateInputSize;
int TemplateOutputSize;

// Get hScanner handle
// Get an encrypted template, TemplateInput and TemplateInputSize
// Set output template buffer size

TemplateoutputSize = MAX_TEMPLATE_SIZE;

ufs_res = UFS_DecryptTemplate(hScanner, TemplateInput, TemplateInputSize,
TemplateOutput, &TemplateOutputSize);
if (ufs_res == UFS_OK)
{
   // UFS_DecryptTemplate is succeeded
}
else
{
   // UFS_DecryptTemplate is failed
```

```
    // Use UFS_GetErrorString function to show error string
}
```

Return Values(refer to return values)

UFS_GetCaptureImageBufferInfo

Gets the information of the capture image buffer.

```
UFS_STATUS UFS_API UFS_GetCaptureImageBufferInfo (
      HUFScanner hScanner,
      int* pnWidth,
      int* pnHeight,
      int* pnResolution );
```

Parameters

- *hScanner [in]* : Handle to the scanner object
- *pnWidth [out]* : Receives the width of the capture image buffer
- *pnHeight [out]* : Receives the height of the capture image buffer
- *pnResolution [out]* : Receives the resolution of the capture image buffer

Examples

```
UFS_STATUS ufs_res;
HUFScaner hScanner;
int nWidth;
int nHeight;
int nResolution;

// Get hScanner handle

ufs_res = UFS_GetCaptureImageBufferInfo(hScanner, &nWidth, &nHeight,
&nResolution);
if (ufs_res == UFS_OK)
{
   // UFS_GetCaptureImageBufferInfo is succeeded
}
else
{
   // UFS_GetCaptureImageBufferInfo is failed
   // Use UFS_GetErrorString function to show error string
}
```

Return Values(refer to return values)

UFS_GetCaptureImageBuffer

Copies the capture image buffer to the specified image data array.

```
UFS_STATUS UFS_API UFS_GetCaptureImageBuffer(
      HUFScanner hScanner,
      unsigned char* pImageData );
```

Parameters

- *hScanner [in]* : Handle to the scanner object
- *pImageData [out]* : Pointer to image data array; The array must be allocated bigger than the size of capture image buffer in advance

Examples

```
UFS_STATUS ufs_res;
HUFScaner hScanner;
int nWidth;
int nHeight;
int nResolution;
unsigned char* pImageData

// Get hScanner handle
// Get capture image buffer information

ufs_res = UFS_GetCaptureImageBufferInfo(hScanner, &nWidth, &nHeight,
&nResolution);

// Error handling routine is omitted
// Allocate image buffer

pImageData = (unsigned char*)malloc(nWidth * nHeight * sizeof(unsigned
char));

ufs_res = UFS_GetCaptureImageBuffer(hScanner, pImageData);
if (ufs_res == UFS_OK)
{
   // UFS_GetCaptureImageBuffer is succeeded
}
else
{
   // UFS_GetCaptureImageBuffer is failed
   // Use UFS_GetErrorString function to show error string
}

// Free image buffer after usage
free(pImageBuffer)
```

Return Values(refer to return values)

UFS_GetCaptureImageBufferToBMPImageBuffer

Copies the capture image buffer to the specified image data of bmp format.

```
UFS_STATUS UFS_API UFS_GetCaptureImageBufferToBMPImageBuffer(
      HUFScanner hScanner,
      unsigned char* pImageData,
      int* pImageDataLength );
```

Parameters

- *hScanner [in]* : Handle to the scanner object
- *pImageData [out]* : Pointer to bmp image data; The buffer must be allocated bigger than the size of capture image buffer in advance
- *pImageDataLength [out]* : pointer to bmp image data size

Examples

```
UFS_STATUS ufs_res;
HUFScaner hScanner;
int nWidth;
int nHeight;
int nResolution;
int nBmpHeaderSize;
unsigned char* pBmpImageBuf;
int nBmpImageBufSize;

// Get hScanner handle

ufs_res = UFS_GetCaptureImageBufferInfo(hScanner, &nWidth, &nHeight,
&nResolution);
// Error handling routine is omitted

nBmpHeaderSize = sizeof(BITMAPFILEHEADER) + sizeof(BITMAPINFOHEADER) +
sizeof(RGBQUAD);

// Allocate bmp image buffer
pBmpImageBuf = (unsigned char*)malloc(nWidth * nHeight + nBmpHeaderSize);

ufs_res = UFS_GetCaptureImageBufferToBMPImageBuffer(hScanner, pBmpImageBuf,
&nBmpImageBufSize);
if (ufs_res == UFS_OK)
{
   // UFS_GetCaptureImageBufferToBMP is succeeded
}
else
{
```

```
    // UFS_GetCaptureImageBufferToBMP is failed
    // Use UFS_GetErrorString function to show error string
}

// Free image buffer after usage
free(pBmpImageBuf);
```

Return Values(refer to return values)

UFS_GetCaptureImageBufferTo19794_4ImageBuffer

Copies the capture image buffer to the specified image data of 19794_4 format.

```
UFS_STATUS UFS_API UFS_GetCaptureImageBufferTo19794_4ImageBuffer(
      HUFScanner hScanner,
      unsigned char* pImageData,
      int* pImageDataLength );
```

Parameters

- *hScanner [in]* : Handle to the scanner object
- *pImageData [out]* : Pointer to 19794_4 format image data; The buffer must be allocated bigger than the size of capture image buffer in advance
- *pImageDataLength [out]* : pointer to 19794_4 format image data size

Examples

```
UFS_STATUS ufs_res;
HUFScaner hScanner;
int nWidth;
int nHeight;
int nResolution;
unsigned char* pConvertedImageBuf;
int nConvertedImageBufSize;

// Get hScanner handle

ufs_res = UFS_GetCaptureImageBufferInfo(hScanner, &nWidth, &nHeight,
&nResolution);
// Error handling routine is omitted

pConvertedImageBuf = (unsigned char*)malloc(nWidth * nHeight);

ufs_res = UFS_GetCaptureImageBufferTo19794_4ImageBuffer(hScanner,
pConvertedImageBuf, &nConvertedImageBufSize);
if (ufs_res == UFS_OK)
{
   // UFS_GetCaptureImageBufferTo19794_4ImageBuffer is succeeded
}
else
{
   // UFS_GetCaptureImageBufferTo19794_4ImageBuffer is failed
   // Use UFS_GetErrorString function to show error string
}

// Free image buffer after usage
free(pConvertedImageBuf)
```

Return Values(refer to return values)

UFS_GetCaptureImageBufferToWSQImageBuffer

Copies the capture image buffer to the specified image data of the WSQ format.

```
UFS_STATUS UFS_API UFS_GetCaptureImageBufferToWSQImageBuffer(
      HUFScanner hScanner,
      const float ratio,
      unsigned char* wsqData,
      int* wsqDataLen );
```

Parameters

- *hScanner [in]* : Handle to the scanner object
- *ratio [in]* : Compression ratio of image
- *wsqData [out]* : Pointer to WSQ format image data; The buffer must be allocated bigger than the size of capture image buffer in advance
- *wsqDataLen [out]* : pointer to WSQ format image data size</fs>

Examples

```
UFS_STATUS ufs_res;
HUFScaner hScanner;
int nWidth;
int nHeight;
int nResolution;
unsigned char* pConvertedImageBuf;
int nConvertedImageBufSize;
float nRatio = 0.75;

// Get hScanner handle

ufs_res = UFS_GetCaptureImageBufferInfo(hScanner, &nWidth, &nHeight,
&nResolution);
// Error handling routine is omitted

pConvertedImageBuf = (unsigned char*)malloc(nWidth * nHeight);

ufs_res = UFS_GetCaptureImageBufferToWSQImageBuffer(hScanner, nRatio,
pConvertedImageBuf, &nConvertedImageBufSize);
if (ufs_res == UFS_OK)
{
   // UFS_GetCaptureImageBufferToWSQImageBuffer is succeeded
}
else
{
   // UFS_GetCaptureImageBufferToWSQImageBuffer is failed
   // Use UFS_GetErrorString function to show error string
}
```

```
// Free image buffer after usage
free(pConvertedImageBuf)
```

Return Values(refer to return values)

UFS_GetCaptureImageBufferToWSQImageBufferVar

Copies the capture image buffer (cropped or expanded to the specified size) to the target image data buffer of the WSQ format.

```
UFS_STATUS UFS_API UFS_GetCaptureImageBufferToWSQImageBufferVar(
      HUFScanner hScanner,
      Const float ratio,
      unsigned char* wsqData,
      int* wsqDataLen,
      int nWidth,
      int nHeight );
```

Parameters

- *hScanner [in]* : Handle to the scanner object
- *ratio [in]* : Compression ratio of image
- *wsqData [out]* : Pointer to WSQ format image data; The buffer must be allocated bigger than the size of capture image buffer in advance
- *wsqDataLen [out]* : pointer to WSQ format image data size
- *nWidth [in]* : Width to resize the capture image
- *nHeight [in]* : Height to resize the capture image

Examples

```
UFS_STATUS ufs_res;
HUFScaner hScanner;
int nWidth;
int nHeight;
unsigned char* pConvertedImageBuf;
int nConvertedImageBufSize;
float nRatio = 0.75;

// Get hScanner handle

// Get image size to resize(nWidth, nHeight)

pConvertedImageBuf = (unsigned char*)malloc(nWidth * nHeight);

ufs_res = UFS_GetCaptureImageBufferToWSQImageBufferVar(hScanner, nRatio,
pConvertedImageBuf, &nConvertedImageBufSize, nWidth, nHeight);

if (ufs_res == UFS_OK)
{
   // UFS_GetCaptureImageBufferToWSQImageBufferVar is succeeded
}
else
{
```

```
    // UFS_GetCaptureImageBufferToWSQImageBufferVar is failed
    // Use UFS_GetErrorString function to show error string
}

// Free image buffer after usage
free(pConvertedImageBuf)
```

Return Values(refer to return values)

UFS_DecompressWSQBMP

Decompress WSQ file and save to BMP file.

```
UFS_STATUS UFS_API UFS_DecompressWSQBMP(
      HUFScanner hScanner,
      char* wsqFile,
      char* bmpFile );
```

Parameters

- *hScanner [in]* : Handle to the scanner object
- *wsqFile [in]* : Specifies file name to get wsq data buffer
- *bmpFile [in]* : Specifies file name to save image buffer

Examples

```
UFS_STATUS ufs_res;
HUFScaner hScanner;
char szWsqFileName[128];
char szBmpFileName[128];

// Get hScanner handle
// Get WSQ file name to save bmp file
// Get Bmp file from the WSQ file

ufs_res = UFS_DecompressWSQBMP (hScanner, szWsqFileName, szBmpFileName);
if (ufs_res == UFS_OK)
{
   // UFS_DecompressWSQBMP is succeeded
}
else
{
   // UFS_DecompressWSQBMP is failed
   // Use UFS_GetErrorString function to show error string
}
```

Return Values(refer to return values)

UFS_DecompressWSQBMPMem

Decompress WSQ buffer and save to image data of bmp format.

```
UFS_STATUS UFS_API UFS_DecompressWSQBMPMem(
      HUFScanner hScanner,
      unsigned char* wsqBuffer,
      int wsqBufferLen,
      unsigned char* bmpBuffer,
      int* bmpBufferLen );
```

Parameters

- *hScanner [in]* : Handle to the scanner object
- *wsqBuffer [in]* : Pointer to WSQ format image data
- *wsqBufferLen [in]* : Size of WSQ format image data
- *bmpBuffer [out]* : Pointer to bmp image data; The array must be allocated bigger than the size of capture image buffer in advance.
- *bmpBufferLen [out]* : pointer to bmp image data size

Examples

```
UFS_STATUS ufs_res;
HUFScaner hScanner;
int nWidth;
int nHeight;
int nResolution;
int nBmpHeaderSize;
unsigned char* pWsqBuffer;
int nWsqBufferLen;
unsigned char* pBmpBuffer;
int nBmpBufferLen;

// Get hScanner handle
// Get WSQ data (ex.UFS_GetCaptureImageBufferToWSQImageBuffer)

ufs_res = UFS_GetCaptureImageBufferInfo(hScanner, &nWidth, &nHeight,
&nResolution);
// Error handling routine is omitted

nBmpHeaderSize = sizeof(BITMAPFILEHEADER) + sizeof(BITMAPINFOHEADER) +
sizeof(RGBQUAD);

pBmpBuffer = (unsigned char*)malloc(nWidth * nHeight * nBmpHeaderSize);

ufs_res = UFS_DecompressWSQBMPMem(hScanner, pWsqBuffer, nWsqBufferLen,
pBmpBuffer, nBmpBufferLen);
if (ufs_res == UFS_OK)
```

```
{
   // UFS_DecompressWSQBMPMem is succeeded
}
else
{
   // UFS_DecompressWSQBMPMem is failed
   // Use UFS_GetErrorString function to show error string
}

// Free image buffer after usage
free(pImageBuffer);
free(pWsqBuffer);
```

Return Values(refer to return values)

UFS_DrawCaptureImageBuffer

Draws the fingerprint image which is acquired using UFS_CaptureSingleImage or UFS_StartCapturing. This function is not supported on java.

```
UFS_STATUS UFS_API UFS_DrawCaptureImageBuffer(
      HUFScanner hScanner,
      HDC hDC,
      int nLeft,
      int nTop,
      int nRight,
      int nBottom,
      int bCore );
```

Parameters

- *hScanner [in]* : Handle to the scanner object
- *hDC [in]* : Handle to the DC where the fingerprint image is drawn
- *nLeft [in]* : Specifies the logical x-coordinate of the upper-left corner of the rectangle
- *nTop [in]* : Specifies the logical y-coordinate of the upper-left corner of the rectangle
- *nRight [in]* : Specifies the logical x-coordinate of the lower-right corner of the rectangle
- *nBottom [in]* : Specifies the logical y-coordinate of the lower-right corner of the rectangle
- *bCore [in]* : Specifies whether the core of fingerprint is drawn of not

Examples

```
UFS_STATUS ufs_res;
HUFScaner hScanner;
HDC hDC;
int nLeft;
int nTop;
int nRight;
int nBottom;
int bCore;

// Get hScanner handle
// Get HDC and determine rectangle to draw image, hDC, nLeft, nTop, nRight,
nBottom
// Determine core to be drawn, bCore

ufs_res = UFS_DrawCaptureImageBuffer(hScanner, hDC, nLeft, nTop, nRight,
nBottom, bCore);
if (ufs_res == UFS_OK)
{
   // UFS_DrawCaptureImageBuffer is succeeded
}
else
{
```

```
    // UFS_DrawCaptureImageBuffer is failed
    // Use UFS_GetErrorString function to show error string
}
```

Return Values(refer to return values)

UFS_DrawFeatureBuffer

Draws the fingerprint image which is acquired using UFS_CaptureSingleImage or UFS_StartCapturing. This function is not supported on java. And should be called after extraction from last captured fingerprint image. If extraction is not performed from the last captured image, this function will not draw the feature in image frame.

```
UFS_STATUS UFS_API UFS_DrawFeatureBuffer(
      HUFScanner hScanner,
      HDC hDC,
      int nLeft,
      int nTop,
      int nRight,
      int nBottom,
      int bCore );
```

Parameters

- *hScanner [in]* : Handle to the scanner object
- *hDC [in]* : Handle to the DC where the fingerprint image is drawn
- *nLeft [in]* : Specifies the logical x-coordinate of the upper-left corner of the rectangle
- *nTop [in]* : Specifies the logical y-coordinate of the upper-left corner of the rectangle
- *nRight [in]* : Specifies the logical x-coordinate of the lower-right corner of the rectangle
- *nBottom [in]* : Specifies the logical y-coordinate of the lower-right corner of the rectangle
- *bCore [in]* : Specifies whether the core of fingerprint is drawn of not

Examples

```
UFS_STATUS ufs_res;
HUFScaner hScanner;
HDC hDC;
int nLeft;
int nTop;
int nRight;
int nBottom;
int bCore;

// Get hScanner handle
// Get HDC and determine rectangle to draw image, hDC, nLeft, nTop, nRight,
nBottom
// Determine core to be drawn, bCore

ufs_res = UFS_DrawFeatureBuffer(hScanner, hDC, nLeft, nTop, nRight, nBottom,
bCore);
if (ufs_res == UFS_OK)
{
   // UFS_DrawFeatureBuffer is succeeded
}
```

```
else
{
   // UFS_DrawFeatureBuffer is failed
   // Use UFS_GetErrorString function to show error string
}
```

Return Values(refer to return values)

UFS_SaveCaptureImageBufferToBMP

Saves the capture image buffer to the specified file of the bitmap format.

```
UFS_STATUS UFS_API UFS_SaveCaptureImageBufferToBMP(
      HUFScanner hScanner,
      char* szFileName );
```

Parameters

- *hScanner [in]* : Handle to the scanner object
- *szFileName [in]* : Specifies file name to save image buffer

Examples

```
UFS_STATUS ufs_res;
HUFScaner hScanner;
char szFileName[128];

// Get hScanner handle
// Get file name, szFileName

ufs_res = UFS_SaveCaptureImageBufferToBMP(hScanner, szFileName);
if (ufs_res == UFS_OK)
{
   // UFS_SaveCaptureImageBufferToBMP is succeeded
}
else
{
   // UFS_SaveCaptureImageBufferToBMP is failed
   // Use UFS_GetErrorString function to show error string
}
```

Return Values(refer to return values)

UFS_SaveCaptureImageBufferTo19794_4

Saves the capture image buffer to the specified file of the 19794_4 format.

```
UFS_STATUS UFS_API UFS_SaveCaptureImageBufferTo19794_4(
      HUFScanner hScanner,
      char* szFileName );
```

Parameters

- *hScanner [in]* : Handle to the scanner object
- *szFileName [in]* : Specifies file name to save image buffer

Examples

```
UFS_STATUS ufs_res;
HUFScaner hScanner;
char szFileName[128];

// Get hScanner handle
// Get file name, szFileName

ufs_res = UFS_SaveCaptureImageBufferTo19794_4(hScanner, szFileName);
if (ufs_res == UFS_OK)
{
   // UFS_SaveCaptureImageBufferTo19794_4 is succeeded
}
else
{
   // UFS_SaveCaptureImageBufferTo19794_4 is failed
   // Use UFS_GetErrorString function to show error string
}
```

Return Values(refer to return values)

UFS_SaveCaptureImageBufferToWSQ

Saves the capture image buffer to the specified file of the WSQ format.

```
UFS_STATUS UFS_API UFS_SaveCaptureImageBufferToWSQ(
      HUFScanner hScanner,
      const float ratio,
      char* szFileName );
```

Parameters

- *hScanner [in]* : Handle to the scanner object
- *ratio [in]* : Compression ratio of image
- *szFileName [in]* : Specifies file name to save image buffer

Examples

```
UFS_STATUS ufs_res;
HUFScaner hScanner;
char szFileName[128];

// Get hScanner handle
// Get file name; szFileName

ufs_res = UFS_SaveCaptureImageBufferToWSQ(hScanner, ratio, szFileName);
if (ufs_res == UFS_OK)
{
   // UFS_SaveCaptureImageBufferToWSQ is succeeded
}
else
{
   // UFS_SaveCaptureImageBufferToWSQ is failed
   // Use UFS_GetErrorString function to show error string
}
```

Return Values(refer to return values)

UFS_SaveCaptureImageBufferToWSQVar

Saves the capture image buffer (cropped or expanded to the specified size) to the target file of the WSQ format.

```
UFS_STATUS UFS_API UFS_SaveCaptureImageBufferToWSQVar(
      HUFScanner hScanner,
      const float ratio,
      char* szFileName,
      int nWidth,
      int nHeight );
```

Parameters

- *hScanner [in]* : Handle to the scanner object
- *ratio [in]* : Compression ratio of image
- *szFileName [in]* : Specfies file name to save image buffer
- *nWidth [in]* : Width to resize the capture image
- *nHeight [in]* : Height to resize the capture image

Examples

```
UFS_STATUS ufs_res;
HUFScaner hScanner;
char szFileName[128];
int nWidth;
int nHeight;

// Get hScanner handle
// Get file name, szFileName
// Get size of capture image to resize; nWidth,nHeight

ufs_res = UFS_SaveCaptureImageBufferToWSQVar(hScanner, ratio, szFileName,
nWidth, nHeight);
if (ufs_res == UFS_OK)
{
   // UFS_SaveCaptureImageBufferToWSQVar is succeeded
}
else
{
   // UFS_SaveCaptureImageBufferToWSQVar is failed
   // Use UFS_GetErrorString function to show error string
}
```

Return Values(refer to return values)

UFS_ClearCaptureImageBuffer

Clears the capture image buffer stored to the internal buffer.

```
UFS_STATUS UFS_API UFS_ClearCaptureImageBuffer(
       HUFScanner hScanner );
```

Parameters

- *hScanner [in]* : Handle to the scanner object

Examples

```
UFS_STATUS ufs_res;
HUFScaner hScanner;

// Get hScanner handle

ufs_res = UFS_ClearCaptureImageBuffer(hScanner);
if (ufs_res == UFS_OK)
{
   // UFS_ClearCaptureImageBuffer is succeeded
}
else
{
   // UFS_ClearCaptureImageBuffer is failed
   // Use UFS_GetErrorString function to show error string
}
```

Return Values(refer to return values)

UFS_GetErrorString

Gets the error string for specified UFS_STATUS value.

```
UFS_STATUS UFS_API UFS_GetErrorString(
      UFS_STATUS res,
      char* szErrorString );
```

Parameters

- *res [in]* : Status return value
- *szErrorString [out]* : Receives error string

Examples

```
UFS_STATUS ufs_res;
char strError[128];

// Get status return code, ufs_res

ufs_res = UFS_GetErrorString(ufs_res, strError);
if (ufs_res == UFS_OK)
{
   // UFS_GetErrorString is succeeded
}
else
{
   // UFS_GetErrorString is failed
}
```

Return Values(refer to return values)

UFS_GetTemplateType

Gets the template type value.

```
UFS_STATUS UFS_API UFS_GetTemplateType(
      HUFScanner hScanner,
      int* nTemplateType );
```

Parameters

- *hScanner [in]* : Handle to the scanner object
- *nTemplateType [out]* : Receives the parameter value of specified parameter type; 'pValue' must point to adequate type that is matched with the parameter type

Template type	Code	Description
UFS_TEMPLATE_TYPE_SUPREMA	2001	Suprema template type
UFS_TEMPLATE_TYPE_ISO19794_2	2002	ISO template type
UFS_TEMPLATE_TYPE_ANSI378	2003	ANSI378 template type

Examples

```
UFS_STATUS ufs_res;
HUFScaner hScanner;
int nTemplateType;
// Get hScanner handle

ufs_res = UFS_GetTemplateType(hScanner, &nTemplateType);
// Error handling routine is omitted
```

Return Values(refer to return values)

UFS_SetTemplateType

Sets the template type value.

```
UFS_STATUS UFS_API UFS_SetTemplateType(
      HUFScanner hScanner,
      int nTemplateType );
```

Parameters

- *hScanner [in]* : Handle to the scanner object
- *nTemplateType [in]* : Parameter type; one of template type

Template type	Code	Description
UFS_TEMPLATE_TYPE_SUPREMA	2001	Suprema template type
UFS_TEMPLATE_TYPE_ISO19794_2	2002	ISO template type
UFS_TEMPLATE_TYPE_ANSI378	2003	ANSI378 template type

Examples

```
UFS_STATUS ufs_res;
HUFScaner hScanner;
int nTemplateType;
// Get hScanner handle

nTemplateType = UFS_TEMPLATE_TYPE_SUPREMA;

ufs_res = UFS_SetTemplateType(hScanner, nTemplateType);
// Error handling routine is omitted
```

Return Values(refer to return values)

UFS_SelectTemplate

Selects n number of good templates from m number of input templates.

```
UFS_STATUS UFS_API UFS_SelectTemplate(
      HUFScanner hScanner,
      unsigned char** ppTemplateInput,
      int* pnTemplateInputSize,
      int nTemplateInputNum,
      unsigned char** ppTemplateOutput,
      int* pnTemplateOutputSize,
      int nTemplateOutputNum );
```

Parameters

- *hScanner [in]* : Handle to the scanner object
- *ppTemplateInput [in]* : Array pointer to the input template arrays
- *pnTemplateInputSize [in]* : Array pointer to input templates'size
- *nTemplateInputNum [in]* : Number of input templates
- *ppTemplateOutput [out]* : Array pointer to the output template arrays
- *pnTemplateOutputSize [out]* : Array pointer to the output templates'size
- *nTemplateOutputNum [in]* : Number of output templates; should be less than input template number by more than one

Examples

```
unsigned char Template[MAX_TEMPLATE_SIZE];
int TemplateSize;
int nEnrollQuality;
UFS_STATUS ufs_res;
int i = ;
// sample number
int inputNum = 4;
int outputNum = 2;

While(1)
{
   // capture a fingerprint image
   .
   .
   ufs_res = UFS_Extract(hScanner, Template, &TemplateSize,
&nEnrollQuality);

   .
   .
   // if UFS_Extract is succeed
   memcpy(InputTemplateArray[i], Template, TemplateSize);
   InputTemplateSizeArray[i] = TemplateSize;
```

```
   i++;
   if(i == inputNum)
      break;
}

ufs_res = UFS_SelectTemplate(hScanner, InputTemplateArray,
InputTemplateSizeArray, inputNum, OutputTemplateArray,
OutputTemplateSizeArray, outputNum);

// UFS_SelectTemplate is succeed
if (ufs_res == UFS_OK)
{
   // If you want to enroll the output templates, move OutputTemplateArray
and OutputTemplateSizeArray data to your template array for enrollment or
database.
}
// select template function has error.
else
{
   // ...
}
```

Return Values(refer to return values)

UFS_SelectTemplateEx

Selects n number of good templates from m number of input templates. This is extended version of UFS_SelectTemplate function to accommodate large size template.

```
UFS_STATUS UFS_API UFS_SelectTemplateEx(
      HUFScanner hScanner,
      int nBufferSize,
      unsigned char** ppTemplateInput,
      int* pnTemplateInputSize,
      int nTemplateInputNum,
      unsigned char** ppTemplateOutput,
      int* pnTemplateOutputSize,
      int nTemplateOutputNum );
```

Parameters

- *hScanner [in]* : Handle to the scanner object
- *nBufferSize [in]* : Template buffer size
- *ppTemplateInput [in]* : Array pointer to the input template arrays
- *pnTemplateInputSize [in]* : Array pointer to the input templates'size
- *nTemplateInputNum [in]* : Number of input templates
- *ppTemplateOutput [out]* : Array pointer to the output template arrays
- *pnTemplateOutputSize [out]* : Array pointer to the output templates'size
- *nTemplateOutputNum [in]* : Number of output templates; should be less than input template number by more than one

Examples

```
unsigned char Template[MAX_TEMPLATE_SIZE];
int TemplateSize;
int nEnrollQuality;
UFS_STATUS ufs_res;
int i = ;
// sample number
int inputNum = 4;
int outputNum = 2;

While(1)
{
   // capture a fingerprint image
   .
   .
   ufs_res = UFS_Extract(hScanner, Template, &TemplateSize,
&nEnrollQuality);

   .
   .
```

```
   // if UFS_Extract is succeed
   memcpy(InputTemplateArray[i], Template, TemplateSize);
   InputTemplateSizeArray[i] = TemplateSize;
   i++; if(i == inputNum)
      break;
}

ufs_res = UFS_SelectTemplateEx(hScanner, MAX_TEMPLATE_SIZE,
InputTemplateArray, InputTemplateSizeArray, inputNum, OutputTemplateArray,
OutputTemplateSizeArray, outputNum);

// UFS_SelectTemplate is succeed
if (ufs_res == UFS_OK)
{
   // If you want to enroll the output templates, move OutputTemplateArray
and OutputTemplateSizeArray data to your template array for enrollment or
database.
}
// select template function has error.
else
{
   // ...
}
```

Return Values(refer to return values)

UFS_GetFPQuality

Calculates the quality score of an image as defined in NISTIR 7151: FingerPrint Image Quality. The score would be between 1(excellent) and 5(poor).

```
UFS_STATUS UFS_API UFS_GetFPQuality(
      HUFScanner hScanner,
      unsigned char* pFPImage,
      int nWidth,
      int nHeight,
      int* pnFPQuality );
```

Parameters

- *hScanner [in]* : Handle to the scanner object
- *pFPImage [in]* : Raw capture image data
- *nWidth [in]* : Width of capture image data
- *nHeight [in]* : Height of capture image data
- *pnFPQuality [in]* : NIST quality score of image data

Examples

```
UFS_STATUS ufs_res;
HUFScaner hScanner;
unsigned char *pCaptImageBuf;
int nCaptImageWidth;
int nCaptImageHeight;
int nFPQuality;

// Capture a fingerprint image
// Get Capture Image Data; pCaptImageBuf, nCaptImageWidth, nCaptImageHeight

ufs_res = UFS_GetFPQuality(hScanner, pCaptImageBuf, nCaptImageWidth,
nCaptImageWidth, &nFPQuality);
if (ufs_res == UFS_OK)
{
   // UFS_ GetFPQuality is successed
}
else
{
   // UFS_ GetFPQuality is failed
   // Use UFS_GetErrorString function to show error string
}
```

Return Values(refer to return values)

UFS_GetFeatureNumber

Get the number of Minutiae from the template data.

```
UFS_STATUS UFS_API UFS_GetFeatureNumber (
      HUFScanner hScanner,
      unsigned char* pTemplate,
      int nTemplateSize,
      int* pnFeatureNum );
```

Parameters

- *hScanner [in]* : Handle to the scanner object
- *pTemplate [in]* : Template data
- *nTemplateSize [in]* : Size of template data
- *pnFeatureNum [out]* : The number of minutiae from pTemplate

Examples

```
unsigned char Template[MAX_TEMPLATE_SIZE];
int TemplateSize;
int nFeatureNum;
int nEnrollQuality;
UFS_STATUS ufs_res;
HUFScaner hScanner;
// Capture a fingerprint image

ufs_res = UFS_Extract(hScanner, Template, &TemplateSize, &nEnrollQuality);
// Error handling routine is omitted

ufs_res = UFS_GetFeatureNumber(hScanner, Template, TemplateSize,
&nFeatureNum);

if (ufs_res == UFS_OK)
{
   // UFS_GetFeatureNumber is succeeded
}
else
{
   // UFS_ GetFeatureNumber is failed
   // Use UFS_GetErrorString function to show error string
}
```

Return Values(refer to return values)

UFS_EnrollUI

Generate the fingerprint enrollment dialog. This function can be called after executing UFS_Init. Enrolling a fingerprint is extracting a template from finger and saving the template. Below sample's UFS_EnrollUI function captures a fingerprint image after setting the template type. And extracts a template from captured fingerprint image. The extracted template will be saved in a specific template array, which is a parameter of the UFS_EnrollUI function. It supported only for Windows environment.

*Constraints
– You should have 'img' folder to use graphical backgrounds and buttons. The application uses the img folder should be at the upper level folder. For example, if the application is at the /bin/sample, 'img' folder should be at the location of /bin/sample/img.
– Enrollment UI is based on COM interface. Thus you should register dll file before use. You can use the pre-coded script (register_enrollui.bat) to register the dll file, or simple type the command 'regsvr32.exe IEnrollUI.dll' at the command prompt.

```
UFS_STATUS UFS_API UFS_EnrollUI(
      HUFScanner hScanner,
      int nTimeout,
      int nOptions,
      BYTE* pUF_FIR_Buf,
      int* pUF_FIR_Buf_Len,
      BYTE* pISO_FIR_Buf,
      int* pISO_FIR_Buf_Len,
      char* pImages_Path,
      BYTE* pImage_Buf = NULL,
      int* pImage_Buf_Len= NULL);
```

Parameters

- *hScanner [in]* : Handle to the scanner object
- *nTimeout [in]* : Timeout of the capture
- *nOptions [in]* : Options for enrollment. Matching level, image Quality, number of fingerprints for enrollment, number of templates per finger
- *pUF_FIR_Buf [out]* : Pointer to the byte array for suprema template. This data pointer is assigned by maximum 1024*20
- *pUF_FIR_Buf_Len [out]* : Pointer to the int array for length of suprema template buffer
- *pISO_FIR_Buf [out]* : Pointer to the byte array for ISO template. This data pointer is assigned by maximum 1024 * 20
- *pISO_FIR_Buf_Len [out]* : Pointer to the int array for length of ISO template buffer
- *pImages_Path [in]* : Path to captured images to be saved. If NULL value is passed, nothing will be saved
- *pImage_Buf [out]* : Pointer to the byte array for image buffer. This data pointer is assigned by maximum 320 * 480
- *pImage_Buf_Len [out]* : Pointer to the int array for length of image buffer

Examples

```
// (1) initialize the buffer
BYTE* pUFBuf = new BYTE[1024*20];
memset(pUFBuf, , 1024*20);
int* pUFBufSize = new int[20];
memset(pUFBufSize, , 20);

BYTE* pISOBuf = new BYTE[1024*20];
memset(pISOBuf, , 1024*20);
int* pISOBufSize = new int[20];
memset(pISOBufSize, , 20);

int nFingersToEnroll = 10;
int nTemplatesPerFinger = 2;

// (2) set the options
int nOptions = UF_PACK_SECURITY(m_nSecurityLevel+1) |
               UF_PACK_QUALITY(m_quality) |
               UF_PACK_NFINGERS(nFingersToEnroll) |
               UF_PACK_NTEMPLATES(nTemplatesPerFinger); //

// (3) execute the enrollment ui api
UFS_EnrollUI(hScanner, m_nTimeout, nOptions, pUFBuf, pUFBufSize, pISOBuf,
pISOBufSize, “c:\\”, null, null);

// (4) get the templates buffer
memcpy(m_pTemplateBuf, pUFBuf, 1024*20*sizeof(BYTE));
memcpy(m_pTemplateBufSize, pUFBufSize, 20*sizeof(int));

// (5) release buffer
delete[] pUFBuf;
delete[] pUFBufSize;
delete[] pISOBuf;
delete[] pISOBufSize;
```

Return Values(refer to return values)

UFS_VerifyUI

Generate the fingerprint verification dialog. This function can be called after executing UFS_Init and UFS_EnrollUI. Two fingerprints can be verified whether they are matched or not. Below sample's UFS_VerifyUI function captures a fingerprint image and extracts a template from the image. And execute 1:1 matching using extracted template and templates enrolled from UFS_EnrollUI.

*Constraints
– Refer to the UFS_EnrollUI constraints.

```
UFS_STATUS UFS_API UFS_VerifyUI(
      HUFScanner hScanner,
      int nTimeout,
      int nOptions,
      int nFPTemplateType,
      BYTE* pFIR_BUF,
      int* pFIR_Buf_Len,
      char* pImages_Path,
      int* nFingerIndex);
```

Parameters

- *hScanner [in]* : Handle to the scanner object
- *nTimeout [in]* : Timeout of the capture
- *nOptions [in]* : Options for enrollment. Matching level, image Quality, number of fingerprints for enrollment, number of templates per finger
- *nFPTemplateType [in]* : Template type for matching enrolled templates with captured fingerprint
- *pFIR_Buf [out]* : Pointer to the byte array for template
- *pFIR_Buf_Len [out]* : Pointer to the int array for length of template buffer
- *pImages_Path [in]* : Path to captured images
- *nFingerIndex [in]* : Matched finger index from enrolled templates. If this value is -1, the matching result is failed

Examples

```
int nFingersToEnroll = 10;
int nTemplatesPerFinger = 2;

// (1) set the options
int nOptions = UF_PACK_SECURITY(m_nSecurityLevel+1) |
               UF_PACK_QUALITY(m_quality) |
               UF_PACK_NFINGERS(nFingersToEnroll) |
               UF_PACK_NTEMPLATES(nTemplatesPerFinger);

// (2) excute the enrollment ui api
UFS_VerifyUI(hScanner, m_nTimeout, UFS_TEMPLATE_TYPE_SUPREMA, nOptions,
```

```
pBuf, pBufSize, “verfication.bmp”, &nFingerIndex);
```

Return Values(refer to return values)

UFS_CaptureSingleUI

Performs same as UFS_CaptureSingle and Popup Window appears once the capturing starts to show captured image then disappears.

```
UFS_STATUS UFS_API UFS_CaptureSingleUI(
      HUFScanner hScanner,
      int nTimeout,
      int nOptions,
      BYTE* pUFImageBuf,
      int* pUFImageWidth,
      int* pUFImageHeight,
      char* pImages_Path ,
      int* nFPQuality);
```

Parameters

- *hScanner [in]* : Effective handle for connected BioMini
- *nTimeout [in]* : Applicable timeout parameter for capture single function
- *nOptions [in]* : Same as UFS_EnrollUI option
- *pUFImageBuf [in]* : Buffer of captured image (The memory buffer has to me managed by the user)
- *pUFImageWidth, int* pUFImageHeight [in]* :
- *pImages_Path [in]* : Width / Height of Captured image (pixel)
- *nFPQuality [in]* : Returns same score as UFS_GetFPQuality

Example

```
UFS_STATUS ufs_res = UFS_GetCaptureImageBufferInfo(hScanner ,&nWidth ,
&nHeight, &nResolution );
unsigned char *pbImage = (unsigned char*)malloc(nWidth * nHeight);
ZeroMemory(pbImage ,  , nWidth* nHeight);
int nOptions =
      UF_PACK_SECURITY(hWnd->m_nSecurityLevel+1) |
      UF_PACK_QUALITY(hWnd->m_quality);
ufs_res = UFS_CaptureSingleUI(hScanner, hWnd->m_nTimeout, nOptions, pbImage,
&nWidth , &nHeight, NULL, &nQuality);
hWnd->AddMessage( "UFS_CaptureSingleUI FPQuality %s : %d\r\n",
ufs_res==UFS_OK?"OK":"Failed", nQuality);
free(pbImage);
```

Return Values(refer to return values)

UFM_Create

Creates a matcher object.

```
UFM_STATUS UFM_API UFM_Create(
      HUFMatcher* phMatcher );
```

Parameters

- *phMatcher [out]* : Pointer to handle of the matcher object

Examples

```
UFM_STATUS ufm_res;
HUFMatcher hMatcher;

ufm_res = UFM_Create(&hMatcher);
if (ufm_res == UFM_OK)
{
   // UFM_Create is succeeded
}
else
{
   // UFM_Create is failed
   // Use UFM_GetErrorString function to show error string
}
```

Return Values (refer to return values)

UFM_Delete

Deletes specified matcher object.

```
UFM_STATUS UFM_API UFM_Delete(
      HUFMatcher pMatcher );
```

Parameters

- *pMatcher [in]* : Handle to the matcher object

Examples

```
UFM_STATUS ufm_res;
HUFMatcher hMatcher;

// Create hMatcher and use

ufm_res = UFM_Delete(hMatcher);
if (ufm_res == UFM_OK)
{
   // UFM_Delete is succeeded
}
else
{
   // UFM_Delete is failed
   // Use UFM_GetErrorString function to show error string
}
```

Return Values (refer to return values)

UFM_GetParameter

Gets parameter value of UFMatcher module.

```
UFM_STATUS UFM_API UFM_GetParameter(
      HUFMatcher pMatcher,
      int nParam,
      void* pValue );
```

Parameters

- *pMatcher [in]* : Handle to the matcher object
- *nParam [in]* : Parameter type; one of parameters

Parameter	Code	Description	Default value
UFM_PARAM_FAST_MODE	301	Fast Mode (0: not use fast mode, 1: use fast mode)	1
UFM_PARAM_SECURITY_LEVEL	302	Set the False Accept Ratio(FAR) (1: Below 1%, 2: Below 0.1%, 3: Below 0.01%, 4: Below 0.001%, 5: Below 0.0001%, 6: Below 0.00001%, 7: Below 0.000001%)	4
UFM_PARAM_USE_SIF	311	Use SIF (0: not use SIF, 1: use SIF)	0
UFM_PARAM_AUTO_ROTATE	321	Rotate Mode(0: not use rotate mode, 1: use rotate mode)	0
UFM_PARAM_SDK_VERSION	210	SDK Version (get only)	-
UFM_PARAM_SDK_COPYRIGHT	211	SDK Copyright (get only)	

- *pValue [out]* : Receives parameter value of specified parameter type; pValue must point to adequate storage type matched to parameter type

Examples

```
UFM_STATUS ufm_res;
HUFMatcher hMatcher;
int nValue;

// Create hMatcher

// Get fast mode
ufm_res = UFM_GetParameter(hMatcher, UFM_PARAM_FAST_MODE, &nValue);
// Error handling routine is omitted

// Get security level
ufm_res = UFM_GetParameter(hMatcher, UFM_PARAM_SECURITY_LEVEL, &nValue);
// Error handling routine is omitted

// Get use SIF
ufm_res = UFM_GetParameter(hMatcher, UFM_PARAM_USE_SIF, &nValue);
// Error handling routine is omitted
```

Return Values (refer to return values)

UFM_SetParameter

Sets parameter value of UFMatcher module.

```
UFM_STATUS UFM_API UFM_SetParameter(
      HUFMatcher pMatcher,
      int nParam,
      void* pValue );
```

Parameters

- *pMatcher [in]* : Handle to the matcher object
- *nParam [in]* : Parameter type; one of parameters

Parameter	Code	Description	Default value
UFM_PARAM_FAST_MODE	301	Fast Mode (0: not use fast mode, 1: use fast mode)	1
UFM_PARAM_SECURITY_LEVEL	302	Set the False Accept Ratio(FAR) (1: Below 1%, 2: Below 0.1%, 3: Below 0.01%, 4: Below 0.001%, 5: Below 0.0001%, 6: Below 0.00001%, 7: Below 0.000001%)	4
UFM_PARAM_USE_SIF	311	Use SIF (0: not use SIF, 1: use SIF)	0
UFM_PARAM_AUTO_ROTATE	321	Rotate Mode(0: not use rotate mode, 1: use rotate mode)	0
UFM_PARAM_SDK_VERSION	210	SDK Version (get only)	-
UFM_PARAM_SDK_COPYRIGHT	211	SDK Copyright (get only)	

- *pValue [in]* : Pointer to parameter value of specified parameter type; pValue must point to adequate storage type matched to parameter type

Examples

```
UFM_STATUS ufm_res;
HUFMatcher hMatcher;
int nValue;

// Create hMatcher

// Set fast mode to nValue
ufm_res = UFM_SetParameter(hMatcher, UFM_PARAM_FAST_MODE, &nValue);
// Error handling routine is omitted

// Set security level to nValue
ufm_res = UFM_SetParameter(hMatcher, UFM_PARAM_SECURITY_LEVEL, &nValue);
// Error handling routine is omitted

// Set use SIF to nValue
ufm_res = UFM_SetParameter(hMatcher, UFM_PARAM_USE_SIF, &nValue);
// Error handling routine is omitted
```

Return Values (refer to return values)

UFM_Verify

Compares two extracted templates.

```
UFM_STATUS UFM_API UFM_Verify(
      HUFMatcher pMatcher,
      unsigned char* pTemplate1,
      int nTemplate1Size,
      unsigned char* pTemplate2,
      int nTemplate2Size,
      int* bVerifySucceed
);
```

Parameters

- *pMatcher [in]* : Handle to the matcher object
- *pTemplate1 [in]* : Pointer to the template1
- *nTemplate1Size [in]* : Specifies the size of the template1
- *pTemplate2 [in]* : Pointer to the template2
- *nTemplate2Size [in]* : Specifies the size of the template2
- *bVerifySucceed [out]* : Receives, whether verification is succeed; 1: verification is succeed, 0: verification is failed

Examples

```
// Assume template size is 1024 bytes
#define MAX_TEMPLATE_SIZE 1024

UFM_STATUS ufm_res;
HUFMatcher hMatcher;
unsigned char Template1[MAX_TEMPLATE_SIZE];
unsigned char Template2[MAX_TEMPLATE_SIZE];
int nTemplate1Size;
int nTemplate2Size;
int bVerifySucceed;

// Create hMatcher
// Get two templates, Template1 and Template2

ufm_res = UFM_Verify(hMatcher, Template1, nTemplate1Size, Template2,
nTemplate2Size, &bVerifySucceed);
if (ufm_res == UFM_OK)
{
   // UFM_Verify is succeeded
   if (bVerifySucceed)
   {
      // Template1 is matched to Template2
   }
```

```
    else
    {
        // Template1 is not matched to Template2
    }
}
else
{
    // UFM_Verify is failed
    // Use UFM_GetErrorString function to show error string
}
```

Return Values (refer to return values)

UFM_VerifyEx

Performs same as UFM_Verify, and returns matching score by 6th parameter (matching score in between 0~1, idle match as the score is close to 1)

```
UFM_STATUS UFM_API UFM_VerifyEx(
      HUFMatcher hMatcher,
      unsigned char* pTemplate1,
      int nTemplate1Size,
      unsigned char* pTemplate2,
      int nTemplate2Size,
      float* fScore,
      int* bVerifySucceed
);
```

Parameter Parameters

- *hMatcher [in]* : Handle to the matcher object
- *pTemplate1 [in]* : Pointer to the template1
- *nTemplate1Size [in]* : Specifies the size of the template1
- *pTemplate2 [in]* : Pointer to the template2
- *nTemplate2Size [in]* : Specifies the size of the template2
- *fScore [out]* : Matching score beween pTemplate1 and pTemplate2
- *bCerifySucceed [out]* : Receives, whether verification is succeed; 1: verification is succeed, 0: verification is failed

Example

```
// Assume template size is 1024 bytes
#define MAX_TEMPLATE_SIZE 1024

UFM_STATUS ufm_res;
HUFMatcher hMatcher;
unsigned char Template1[MAX_TEMPLATE_SIZE];
unsigned char Template2[MAX_TEMPLATE_SIZE];
int nTemplate1Size;
int nTemplate2Size;
float fScore;
int bVerifySucceed;

// Create hMatcher
// Get two templates, Template1 and Template2

ufm_res = UFM_Verify(hMatcher, Template1, nTemplate1Size, Template2,
nTemplate2Size, &fScore, &bVerifySucceed);
if (ufm_res == UFM_OK)
{
   // UFM_Verify is succeeded
   if (bVerifySucceed)
```

```
    {
        // Template1 is matched to Template2
    }
    else
    {
        // Template1 is not matched to Template2
    }
}
else
{
    // UFM_Verify is failed
    // Use UFM_GetErrorString function to show error string
}
```

Return Values (refer to return values)

UFM_Identify, UFM_IdentifyMT

Compares a template with given template array. UFM_IdentifyMT function uses multi threads internally for faster identifying in multi-core systems.

```
UFM_STATUS UFM_API UFM_Identify(
      HUFMatcher pMatcher,
      unsigned char* pTemplate1,
      int nTemplate1Size,
      unsigned char** ppTemplate2,
      int* pnTemplate2Size,
      int nTemplate2Num,
      int nTimeout,
      int* pnMatchTemplate2Index );

UFM_STATUS UFM_API UFM_IdentifyMT(
      HUFMatcher pMatcher,
      unsigned char* pTemplate1,
      int nTemplate1Size,
      unsigned char** ppTemplate2,
      int* pnTemplate2Size,
      int nTemplate2Num,
      int nTimeout,
      int* pnMatchTemplate2Index );
```

Parameters

- *pMatcher [in]* : Handle of the matcher object
- *pTemplate1 [in]* : Pointer to the template
- *nTemplate1Size [in]* : Specifies the size of the template
- *ppTemplate2 [in]* : Pointer to the template array
- *pnTemplate2Size [in]* : Pointer to the template size array
- *nTemplate2Num [in]* : Specifies the number of templates in the template array
- *nTimeout [in]* : Specifies maximum time for identifying in milliseconds; If elapsed time for identifying exceeds nTimeout, function stops further identifying and returns UFM_ERR_MATCH_TIMEOUT; 0 means infinity
- *pnMatchTemplate2Index [out]* : Receives the index of matched template in the template array; -1 means pTemplate1 is not matched to all of templates in ppTemplate2

Examples

```
// Assume template size is 1024 bytes
#define MAX_TEMPLATE_SIZE 1024 UFM_STATUS ufm_res;
HUFMatcher hMatcher;
unsigned char Template1[MAX_TEMPLATE_SIZE];
unsigned char** ppTemplate2;
int nTemplate1Size;
int* pnTemplate2Size;
```

```
int nTemplate2Num;
int nTimeout;
int nMatchTemplate2Index;
int i;

// Create hMatcher

// Get input template from user, Template1

// Make template array from DB or something
// Get number of template to nTemplate2Num
ppTemplate2 = (unsigned char**)malloc(nTemplate2Num * sizeof(unsigned
char*));
pnTemplate2Size = (int*)malloc(nTemplate2Num * sizeof(int));
for (i = ; i < nTemplate2Num; i++)
{
   ppTemplate2[i] = (unsigned char*)malloc(MAX_TEMPLATE_SIZE *
sizeof(unsigned char));
   // Copy i th template to ppTemplate2[i]
   // Set i th template size to pnTemplateSize[i]
}

// Set match timeout to nTimeout

ufm_res = UFM_Identify(hMatcher, Template1, Template1Size, ppTemplate2,
pnTemplate2Size, nTemplate2Num, nTimeout, &nMatchTemplate2Index);

if (ufm_res == UFM_OK)
{
   // UFM_Identify is succeeded
   if (nMatchTemplate2Index != -1)
   {
      // Input fingerprint Template1 is matched to
ppTemplate2[nMatchTemplate2Index]
   }
   else
   {
      // Input fingerprint is not in ppTemplate2
   }
}
else
{
   // UFM_Identify is failed
   // Use UFM_GetErrorString function to show error string
}

// Free template array
free(pnTemplate2Size);
for (i = ; i < nTemplate2Num; i++)
{
   free(ppTemplate2[i]);
```

```
}

free(ppTemplate2);
```

Return Values (refer to return values)

UFM_AbortIdentify

Aborts current identifying procedure started using UFM_Identify.

```
UFM_STATUS UFM_API UFM_AbortIdentify(
      HUFMatcher pMatcher );
```

Parameters

- *pMatcher [in]* : Handle to the matcher object

Examples

```
UFM_STATUS ufm_res;
HUFMatcher hMatcher;

// Create hMatcher
// Start UFM_Identify

ufm_res = UFM_AbortIdentify(hMatcher);
if (ufm_res == UFM_OK)
{
   // UFM_AbortIdentify is succeeded
}
else
{
   // UFM_AbortIdentify is failed
   // Use UFM_GetErrorString function to show error string
}
```

Return Values (refer to return values)

UFM_IdentifyInit

Initializes identify with input template.

```
UFM_STATUS UFM_API UFM_IdentifyInit(
      HUFMatcher pMatcher,
      unsigned char* pTemplate1,
      int nTemplate1Size, );
```

Parameters

- *pMatcher [in]* : Handle to the matcher object
- *pTemplate1 [in]* : Pointer to the template
- *nTemplate1Size [in]* : Specifies the size of the template

Examples

```
// Assume template size is 1024 bytes
#define MAX_TEMPLATE_SIZE 1024

UFM_STATUS ufm_res;
HUFMatcher hMatcher;
unsigned char Template1[MAX_TEMPLATE_SIZE];
int nTemplate1Size;

// Create hMatcher
// Get Template1

ufm_res = UFM_IdentifyInit(hMatcher, Template1, nTemplate1Size);
if (ufm_res == UFM_OK)
{
   // UFM_IdentifyInit is succeeded
}
else
{
   // UFM_IdentifyInit is failed
   // Use UFM_GetErrorString function to show error string
}
```

Return Values (refer to return values)

UFM_IdentifyNext

Matches one input template to the template specified in UFM_IdentifyInit.

```
UFM_STATUS UFM_API UFM_IdentifyNext(
      HUFMatcher pMatcher,
      unsigned char* pTemplate2,
      int nTemplate2Size,
      int* bIdentifySucceed );
```

Parameters

- *pMatcher [in]* : Handle to the matcher object
- *pTemplate2 [in]* : Pointer to the template array
- *nTemplate2Size [in]* : Specifies the size of the template array
- *bIdentifySucceed [out]* : Receives whether identification is succeed; 1: identification is succeed, 0: identification is failed

Examples

```
#define MAX_TEMPLATE_NUM 50

UFM_STATUS ufm_res;
HUFMatcher hMatcher;
unsigned char *Template2[MAX_TEMPLATE_NUM * 2];
int nTemplate2Size[MAX_TEMPLATE_NUM * 2];
int nTemplate2Num;
int bIdentifySucceed;
int i;

// Create hMatcher
// Execute UFM_IdentifyInit with query template
// Get number of templates in DB or something, and save it to nTemplate2Num

bIdentifySucceed = ;
for (i = ; i < nTemplate2Num; i++)
{
   // Get one template in DB or something, and save it to Template2 and
nTemplate2Size

   ufm_res = UFM_IdentifyNext(hMatcher, Template2[i], nTemplate2Size[i],
&bIdentifySucceed);
   if (ufm_res == UFM_OK)
   {
      // UFM_IdentifyNext is succeeded
   }
   else
   {
```

```
      // UFM_IdentifyNext is failed
      // Use UFM_GetErrorString function to show error string
      // return;
   }
   if (bIdentifySucceed)
   {
      // Identification is succeed break;
   }
}
if (!bIdentifySucceed)
{
   // Identification is failed
}
```

Return Values (refer to return values)

UFM_RotateTemplate

Rotates the specified template to the amount of 180 degrees.

```
UFM_STATUS UFM_API UFM_RotateTemplate(
      HUFMatcher pMatcher,
      unsigned char* pTemplate,
      int nTemplateSize );
```

Parameters

- *pMatcher[in]* : Handle to the matcher object
- *pTemplate [in / out]* : Pointer to the template
- *nTemplateSize [in]* : Specifies the size of the template

Examples

```
// Assume template size if 1024 bytes
#define MAX_TEMPLATE_SIZE 1024

UFM_STATUS ufm_res;
HUFMatcher hMatcher;
unsigned char Template[MAX_TEMPLATE_SIZE];
int nTemplateSize;

// Create hMatcher
// Get a template, and save it to Template and nTemplateSize

ufm_res = UFM_RotateTemplate(hMatcher, Template, nTemplateSize);
if (ufm_res == UFM_OK)
{
   // UFM_RotateTemplate is succeeded
}
else
{
   // UFM_RotateTemplate is failed // Use UFM_GetErrorString function to
show error string
}
```

Return Values (refer to return values)

UFM_GetErrorString

Gets the error string for specified UFM_STATUS value.

```
UFM_STATUS UFM_API UFM_GetErrorString(
      UFM_STATUS res,
      char* szErrorString );
```

Parameters

- *res [in]* : Status return value
- *szErrorString [out]* : Receives error string

Examples

```
UFM_STATUS ufm_res;
char strError[128];

// Get status return code,

ufm_res ufm_res = UFM_GetErrorString(ufm_res, strError);
if (ufm_res == UFM_OK)
{
   // UFM_GetErrorString is succeeded
}
else
{
   // UFM_GetErrorString is failed
}
```

Return Values (refer to return values)

UFM_GetTemplateType

Gets the parameter value.

```
UFM_STATUS UFM_API UFM_GetTemplateType(
      HUFMatcher pMatcher,
      int* nTemplateType );
```

Parameters

- *pMatcher [in]* : Handle to the matcher object
- *nTemplateType [out]* : Receives parameter value of specified parameter type; pValue must point to adequate storage type matched to template type

Template type	Code	Description
UFM_TEMPLATE_TYPE_SUPREMA	2001	Suprema template type
UFM_TEMPLATE_TYPE_ISO19794_2	2002	ISO template type
UFM_TEMPLATE_TYPE_ANSI378	2003	ANSI378 template type

Examples

```
UFM_STATUS ufm_res;
HUFMatcher hMatcher;
int nTemplateType;

// Get hMatcher handle

ufm_res = UFM_GetTemplateType(hMatcher,&nTemplateType);
// Error handling routine is omitted
```

Return Values (refer to return values)

UFM_SetTemplateType

Gets parameter value.

```
UFM_STATUS UFM_API UFM_SetTemplateType(
      HUFMatcher pMatcher,
      int nTemplateType );
```

Parameters

- *pMatcher [in]* : Handle to the matcher object
- *nTemplateType [in]* : Parameter type; one of template type

Template type	Code	Description
UFM_TEMPLATE_TYPE_SUPREMA	2001	Suprema template type
UFM_TEMPLATE_TYPE_ISO19794_2	2002	ISO template type
UFM_TEMPLATE_TYPE_ANSI378	2003	ANSI378 template type

Examples

```
UFM_STATUS ufm_res;
HUFMatcher hMatcher;
int nTemplateType;

// Get hScanner handle

nTemplateType = UFM_TEMPLATE_TYPE_SUPREMA;

ufs_res = UFM_SetTemplateType(hMatcher, nTemplateType);
// Error handling routine is omitted
```

Return Values (refer to return values)

UFS_STATUS

Every function in a UFScanner module returns UFS_OK when it succeeds. When it fails, it returns a value corresponding to a error code. Please find the error code on the followings if you'd like to know the information about the UFS_STATUS (integer) value.

Code	Value	Description
UFS_OK	0	Success
UFS_ERROR	-1	General error
UFS_ERR_NO_LICENSE	-101	Device is not connected or License is not located
UFS_ERR_LICENSE_NOT_MATCH	-102	License does not match
UFS_ERR_LICENSE_EXPIRED	-103	License has expired
UFS_ERR_NOT_SUPPORTED	-111	This function is not supported
UFS_ERR_INVALID_PARAMETERS	-112	Input parameters are invalid
UFS_ERR_ALREADY_INITIALIZED	-201	Module is already initialized
UFS_ERR_NOT_INITIALIZED	-202	Module is not initialized
UFS_ERR_DEVICE_NUMBER_EXCEED	-203	Device number exceeds
UFS_ERR_LOAD_SCANNER_LIBRARY	-204	Error on loading the library of a scanner
UFS_ERR_CAPTURE_RUNNING	-211	Capturing is started using UFS_CaptureSingleImage or UFS_StartCapturing
UFS_ERR_CAPTURE_FAILED	-212	Capturing is timeout or aborted
UFS_ERR_NOT_GOOD_IMAGE	-301	Input image is not good
UFS_ERR_EXTRACTION_FAILED	-302	Extraction is failed
UFS_ERR_CORE_NOT_DETECTED	-351	Core is not detected
UFS_ERR_CORE_TO_LEFT_TOP	-353	Move finger to left-top
UFS_ERR_CORE_TO_TOP	-354	Move finger to top
UFS_ERR_CORE_TO_RIGHT_TOP	-355	Move finger to right-top
UFS_ERR_CORE_TO_RIGHT	-356	Move finger to right
UFS_ERR_CORE_TO_RIGHT_BOTTOM	-357	Move finger to right-bottom
UFS_ERR_CORE_TO_BOTTOM	-358	Move finger to bottom
UFS_ERR_CORE_TO_LEFT_BOTTOM	-359	Move finger to left-bottom

UFM_STATUS

Every function in a UFMatcher module returns UFM_OK when it succeeds. When it fails, it returns a value corresponding to a error code. Please find the error code on the followings if you'd like to know the information about the UFM_STATUS (integer) value.

Code	Value	Description
UFM_OK	0	Success
UFM_ERROR	-1	General error
UFM_ERR_NO_LICENSE	-101	System has no license
UFM_ERR_LICENSE_NOT_MATCH	-102	License does not match
UFM_ERR_LICENSE_EXPIRED	-103	License has expired
UFM_ERR_NOT_SUPPORTED	-111	This function is not supported
UFM_ERR_INVALID_PARAMETERS	-112	Input parameters are invalid
UFM_ERR_MATCH_TIMEOUT	-401	Matching is timeout
UFM_ERR_MATCH_ABORTED	-402	Matching is aborted
UFM_ERR_TEMPLATE_TYPE	-411	Template type does not match

4. .net Development

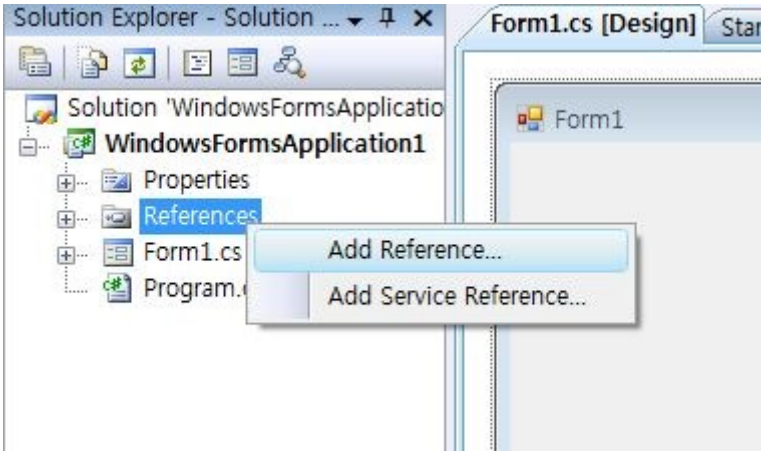
BioMini SDK provides .net Wrapper DLL for .net development.

- Suprema.UFScanner.dll
- Suprema.UFMatcher.dll

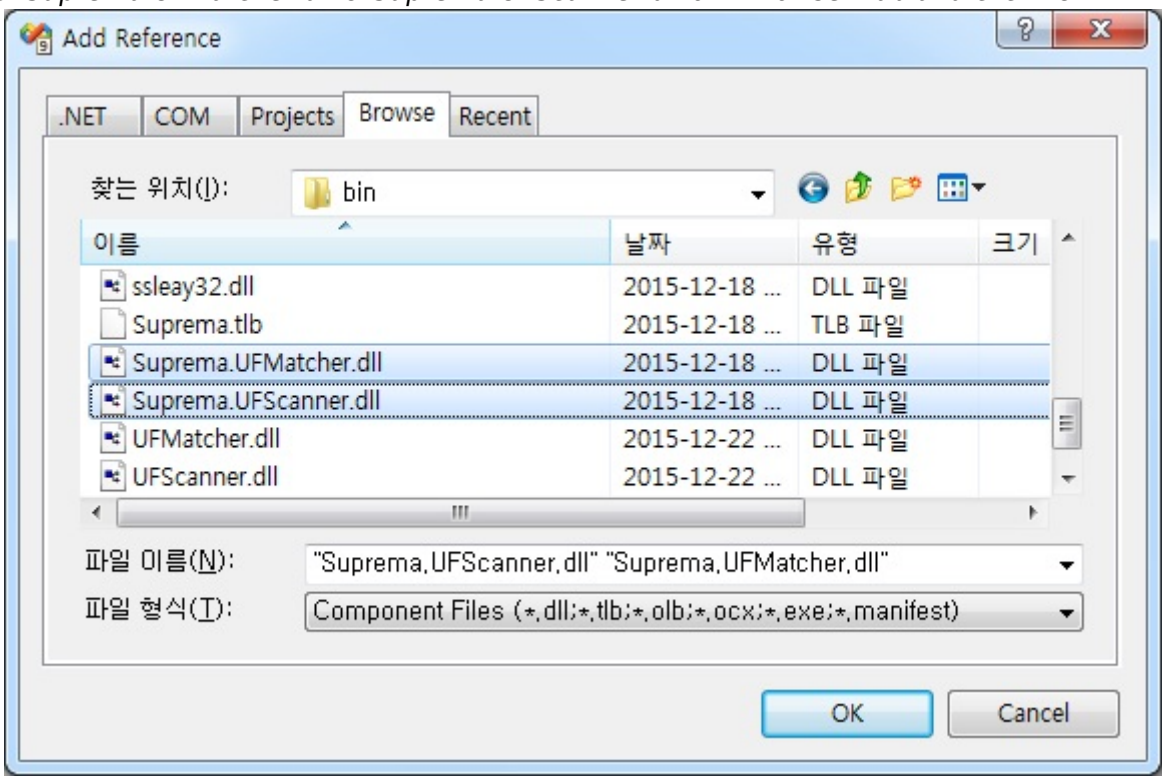
By adding above wrapper dll to the development project reference, allows to use .net API easy. To run the program, not only the .net wrapper dll, UFScanner.dll & UFMatcher.dll must be located at exe folder together.

4.1 Environment Setting

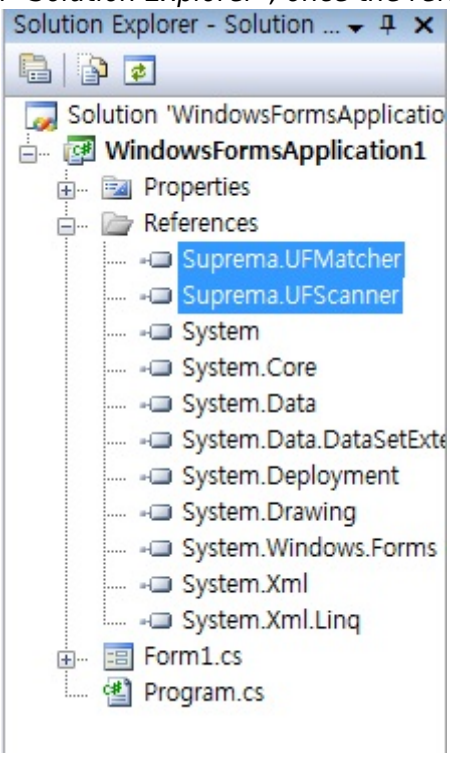
1. Click "Add Reference..." on "Solution Explorer"



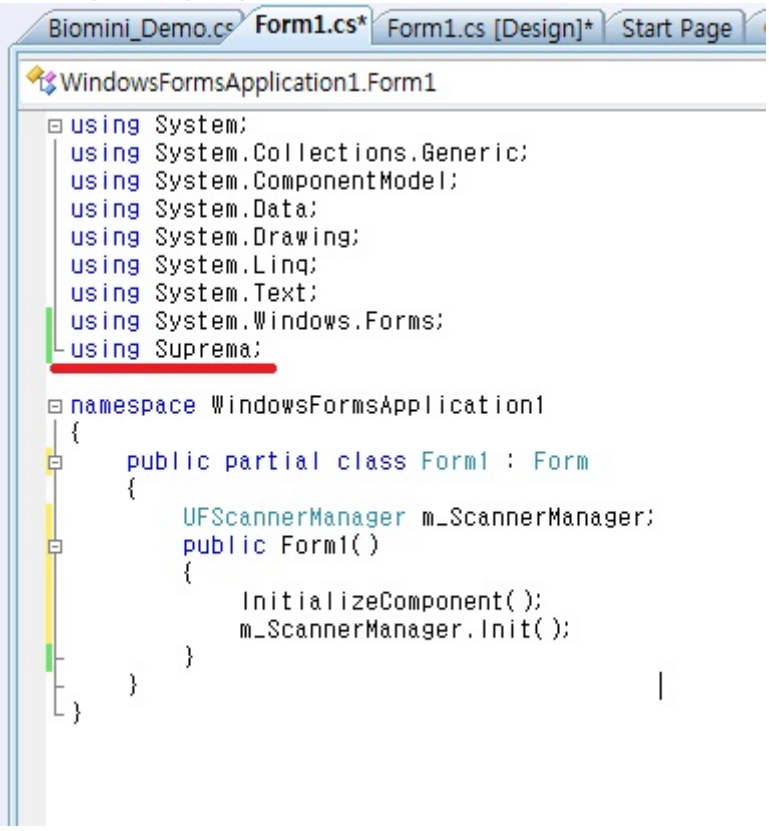
2. Select Suprema.UFMatcher.dll & Suprema.UFScanner.dll on "Browse" tab and click "OK".



3. Can be confirmed as below from “Solution Explorer”, once the reference is successfully added.



4. Can use .net APIs by adding “using Suprema;” to the source code.



4.2 .net APIs

This Document contains reference of all modules included in BioMini SDK for .NET developers using following languages, ***<Visual C# , Visual Basic .NET>*** In this document, APIs are described using ***C# language***.

UFScanner.Init()
: Initializes a UFScanner module

UFScanner.Update()
: Enforces a UFScanner module to update the connection state of scanners

UFScanner.Uninit()
: Un-initializes a UFScanner module

UFScanner.SetScannerCallback()
: Registers a scanner callback function

UFScanner.RemoveScannerCallback()
: Removes a registered scanner callback function

UFScanner.GetScannerNumber()
: Gets the number of scanners

UFScanner.GetScannerHandle()
: Gets the scanner handle using the scanner index

UFScanner.GetScannerHandleByID()
: Gets the scanner handle using a scanner ID

UFScanner.GetScannerIndex()
: Gets the scanner index that is assigned to the scanner handle

UFScanner.GetScannerID()
: Gets a scanner ID that is assigned to the scanner handle

UFScanner.GetScannerType()
: Gets the scanner type that is assigned to the scanner handle

UFScanner.GetParameter()
: Gets the parameter value of a UFScanner module

UFScanner.SetParameter()
: Sets the parameter value of a UFScanner module

UFScanner.IsSensorOn()
: Checks whether a scanner is connected or not

UFScanner.IsFingerOn()

Checks whether a finger is placed on a scanner or not

UFScanner.CaptureSingleImage()

Captures single image. Captured image is stored to the internal buffer

UFScanner.StartCapturing()

Starts capturing. The capture is going on until the specified time exceeds

UFScanner.StartAutoCapture()

Starts the automatic capture. Currently this function is working for Suprema SFR600(BioMini Slim) only

UFScanner.IsCapturing()

Checks if the specified scanner is running to capture which is started by UFS_CaptureSingleImage or UFS_StartCapturing

UFScanner.AbortCapturing()

Aborts capturing which is started by UFS_CaptureSingleImage or UFS_StartCapturing

UFScanner.Extract()

Extracts a template from the stored image buffer which is acquired using UFScanner.CaptureSingleImage() or UFScanner.StartCapturing()

UFScanner.ExtractEx()

Extracts a template from the stored image buffer which is acquired using UFScanner.CaptureSingleImage() or UFScanner.StartCapturing().This is extended version of UFScanner.Extract function to accommodate a template with large size

UFScanner.SetEncryptionKey()

Sets the encryption key

UFScanner.EncryptTemplate()

Encrypts a template

UFScanner.DecryptTemplate()

Decrypt a template

UFScanner.GetCaptureImageBufferInfo()

Gets the information of the capture image buffer

UFScanner.GetCaptureImageBuffer()

Copies the capture image buffer to the specified image data array

UFScanner.GetCaptureImageBufferToBMPImageBuffer()

Copies the capture image buffer to the specified image data of bmp format

UFScanner.GetCaptureImageBufferTo19794_4ImageBuffer()

Copies the capture image buffer to the specified image data of 19794_4 format

UFScanner.GetCaptureImageBufferToWSQImageBuffer()

Copies the capture image buffer to the specified image data of the WSQ format

UFScanner.GetCaptureImageBufferToWSQImageBufferVar()
Copies the capture image buffer (cropped or expanded to the specified size) to the target image data buffer of the WSQ format

UFScanner.DecompressWSQBMP()
Decompress a WSQ file and save to a BMP file

UFScanner.DecompressWSQBMPMem()
Decompress a WSQ buffer and save to the image data of the bmp format

UFScanner.DrawCaptureImageBuffer()
Draws the fingerprint image which is acquired using UFScanner.CaptureSingleImage() or UFScanner.StartCapturing(). This function is not supported on java

UFScanner.DrawFeatureBuffer()
Draws the fingerprint image which is acquired using UFScanner.CaptureSingleImage() or UFScanner.StartCapturing(). This function is not supported on java And should be called after the extraction from the last captured fingerprint image. If extraction is not performed from the last captured image, this function will not draw the feature in the image frame

UFScanner.SaveCaptureImageBufferToBMP()
Saves the capture image buffer to the specified file of the bitmap format

UFScanner.SaveCaptureImageBufferTo19794_4()
Saves the capture image buffer to the specified file of the 19794_4 format

UFScanner.SaveCaptureImageBufferToWSQ()
Saves the capture image buffer to the specified file of the WSQ format

UFScanner.SaveCaptureImageBufferToWSQVar()
Saves the capture image buffer (cropped or expanded to the specified size) to the target file of the WSQ format

UFScanner.ClearCaptureImageBuffer()
Clears the capture image buffer stored to the internal buffer

UFScanner.GetErrorString()
Gets the error string for specified UFS_STAUS value

UFScanner.GetTemplateType()
Gets the template type value

UFScanner.SetTemplateType()
Sets the template type value

UFScanner.SelectTemplate()
Selects n number of good templates from m number of input templates

UFScanner.SelectTemplateEx()

Selects n number of good templates from m number of input templates This is extended version of UFS_SelectTemplate function to accommodate the template with large size

UFScanner.GetFPQuality()

Calculates the quality score of an image as defined in NISTIR 7151: FingerPrint Image Quality. The score would be between 1(excellent) and 5(poor)

UFScanner.GetFeatureNumber()

Get number of Minutiae from template data

UFScanner.EnrollUI()

Generates the fingerprint enrollment dialog. This function can be called after executing UFS_Init(). Enrolling a fingerprint is extracting a template from finger and saving the template. Below sample's UFS_EnrollUI() captures a fingerprint image after setting the template type. And extracts a template from captured fingerprint image. The extracted template will be saved in a specific template array, which is a parameter of the UFS_EnrollUI(). It supported only for Windows environment

UFScanner.VerifyUI()

Generates the fingerprint verification dialog. This function can be called after executing UFS_Init() and UFS_EnrollUI(). Two fingerprints can be verified whether they are matched or not. Below sample's UFS_VerifyUI() captures a fingerprint image and extracts a template from the image. And execute 1:1 matching using extracted template and templates enrolled from UFS_EnrollUI()

UFMatcher.Create()

Creates a matcher object

UFMatcher.Delete()

Deletes a specified matcher object

UFMatcher.GetParameter()

Gets the parameter value of UFMatcher module

UFMatcher.SetParameter()

Sets the parameter value of UFMatcher module

UFMatcher.Verify()

Compares two extracted templates

UFMatcher.Identify(),IdentifyMT()

Compares a template with given template array UFMatcher.IdentifyMT function uses multi threads internally for faster identifying in multi-core systems

UFMatcher.AbortIdentify()

Aborts current identifying procedure started using UFMatcher.Identify()

UFMatcher.IdentifyInit()

Initializes identify with input template

UFMatcher.IdentifyNext()

Matches one input template to the template specified in UFMatcher.IdentifyInit()

UFMatcher.RotateTemplate()

Rotates the specified template to the amount of 180 degrees

UFMatcher.GetErrorString()

Gets the error string for the specified UFMatcher.STAUS value

UFMatcher.GetTemplateType()

Gets the parameter value

UFMatcher.SetTemplateType()

Sets the parameter value

UFScanner.Init

Initializes a UFScanner module.

```
public UFS_STATUS Init();
```

Return Values (refer to return values)

UFScanner.Update

Enforces a UFScanner module to update the connection state of scanners.

```
public UFS_STATUS Update();
```

Return Values (refer to return values)

UFScanner.Uninit

Un-initializes a UFScanner module.

```
public UFS_STATUS Uninit();
```

Return Values (refer to return values)

UFScanner.SetScannerCallback

Registers the scanner callback function.

Return Values (refer to return values)

UFScanner.RemoveScannerCallback

Removes the registered scanner callback function.

```
public UFS_STATUS RemoveScannerCallback();
```

Return Values (refer to return values)

UFScanner.GetScannerNumber

Gets the number of scanners.

Return Values (refer to return values)

UFScanner.GetScannerHandle

Gets the scanner handle using a scanner index.

Return Values (refer to return values)

UFScanner.GetScannerHandleByID

Gets the scanner handle using a scanner ID.

Return Values (refer to return values)

UFScanner.GetScannerIndex

Gets a scanner index that is assigned to the scanner handle.

Return Values (refer to return values)

UFScanner.GetScannerID

Gets scanner ID assigned to scanner handle.

Return Values (refer to return values)

UFScanner.GetScannerType

Gets the scanner type that is assigned to the scanner handle.

```
public enum UFS_SCANNER_TYPE
```

Parameters

- *pnScannerType [out]* : Receives one of the scanner type

Scanner type	Code	Description
UFS_SCANNER_TYPE_SFR200	1001	Suprema SFR200
UFS_SCANNER_TYPE_SFR300	1002	Suprema SFR300-S
UFS_SCANNER_TYPE_SFR300v2	1003	Suprema SFR300v2, SFR400, SFR410
UFS_SCANNER_TYPE_SFR410	1006	Suprema SFR410
UFS_SCANNER_TYPE_SFR500	1004	Suprema SFR500
UFS_SCANNER_TYPE_SFR600	1005	Suprema SFR600
UFS_SCANNER_TYPE_SFR550	1007	Suprema SFR550

Return Values (refer to return values)

UFScanner.GetParameter

Gets parameter value of UFScanner module.

Parameters

Parameter	Code	Description	Default value
UFS_PARAM_TIMEOUT	201	Timeout (millisecond unit) (0: infinite)	5000
UFS_PARAM_BRIGHTNESS	202	Brightness (0 ~ 255); Higher value means darker image.* Not supported Device: BioMini-Slim(SFU-S20, SFU-S20B) BioMini(SFU-300)	100
UFS_PARAM_SENSITIVITY	203	Sensitivity (0 ~ 7); Higher value means more sensitive	4
UFS_PARAM_SERIAL	204	Serial (get only)	-
UFS_PARAM_SDK_VERSION	210	SDK Version (get only)	
UFS_PARAM_SDK_COPYRIGHT	211	SDK Copyright (get only)	
UFS_PARAM_DETECT_CORE	301	Detect core (0: not use core, 1: use core)	0
UFS_PARAM_TEMPLATE_SIZE	302	Template size (byte unit) (256 ~ 1024, 32 bytes step size)	1024
UFS_PARAM_USE_SIF	311	Use SIF (0: not use SIF, 1: use SIF)	0
UFS_PARAM_DETECT_FAKE	312	Use live Finger Detection (0: not use LFD, 1 ~3 : use LFD); Higher value means more strong to fake finger * Supported Device: BioMini Slim(SFU-S20, SFU-S20B)	0

- *pValue [out]* : Receives parameter value of specified parameter type; pValue must point to adequate storage type matched to parameter type

Return Values (refer to return values)

UFScanner.SetParameter

Sets parameter value of UFScanner module.

Parameters

Parameter	Code	Description	Default value
UFS_PARAM_TIMEOUT	201	Timeout (millisecond unit) (0: infinite)	5000
UFS_PARAM_BRIGHTNESS	202	Brightness (0 ~ 255); Higher value means darker image.* Not supported Device: BioMini-Slim(SFU-S20, SFU-S20B) BioMini(SFU-300)	100
UFS_PARAM_SENSITIVITY	203	Sensitivity (0 ~ 7); Higher value means more sensitive	4
UFS_PARAM_SERIAL	204	Serial (get only)	-
UFS_PARAM_SDK_VERSION	210	SDK Version (get only)	
UFS_PARAM_SDK_COPYRIGHT	211	SDK Copyright (get only)	
UFS_PARAM_DETECT_CORE	301	Detect core (0: not use core, 1: use core)	0
UFS_PARAM_TEMPLATE_SIZE	302	Template size (byte unit) (256 ~ 1024, 32 bytes step size)	1024
UFS_PARAM_USE_SIF	311	Use SIF (0: not use SIF, 1: use SIF)	0
UFS_PARAM_DETECT_FAKE	312	Use live Finger Detection (0: not use LFD, 1 ~3 : use LFD); Higher value means more strong to fake finger * Supported Device: BioMini Slim(SFU-S20, SFU-S20B)	0

Return Values (refer to return values)

UFScanner.IsSensorOn

Checks whether a scanner is connected or not.

Return Values (refer to return values)

UFScanner.IsFingerOn

Checks whether a finger is placed on a scanner or not.

Parameters

- *pbFingerOn [out]* : Checks if a finger is placed on the specified scanner; 1: a finger is on the scanner, 0: a finger is not on the scanner

Return Values (refer to return values)

UFScanner.CaptureSingleImage

Captures single image. Captured image is stored to the internal buffer.

```
public UFS_STATUS CaptureSingleImage();
```

Return Values (refer to return values)

UFScanner.StartCapturing

Starts capturing. The capture is going on until the specified time exceeds.

```
public UFS_STATUS StartCapturing();
```

Return Values (refer to return values)

UFScanner.StartAutoCapture

Starts the automatic capture. Currently this function is working for Suprema SFR600(BioMini Slim) only.

```
public UFS_STATUS StartAutoCapture();
```

Return Values (refer to return values)

UFScanner.IsCapturing

Checks if the specified scanner is running to capture which is started by UFScanner.CaptureSingleImage() or UFScanner.StartCapturing().

Parameters

- *pbCapturing [out]* : Checks if the specified scanner is running capturing; 1: the capture is running, 0: the capture is not running

Return Values (refer to return values)

UFScanner.AbortCapturing

Aborts capturing which is started by UFScanner.CaptureSingleImage() or UFScanner.StartCapturing().

```
public UFS_STATUS AbortCapturing();
```

Return Values (refer to return values)

UFScanner.Extract

Extracts a template from the stored image buffer which is acquired using UFScanner.CaptureSingleImage() or UFScanner.StartCapturing().

```
public UFS_STATUS Extract(
    byte[] Template,
    out int TemplateSize,
    out int EnrollQuality
);
```

Parameters

- *pTemplate [out]* : Pointer to the template array; The array must be allocated in advance
- *pnTemplateSize [out]* : Receives the size (in bytes) of pTemplate
- *pnEnrollQuality [out]* : Receives the quality of enrollment; Quality value ranges from 1 to 100. Typically this value should be above 30 for further processing such as enroll and matching. Especially in case of enrollment, the use of good quality image (above 50) is highly recommended.

Return Values (refer to return values)

UFScanner.ExtractEx

Extracts a template from the stored image buffer which is acquired using UFScanner.CaptureSingleImage() or UFScanner.StartCapturing(). This is extended version of UFScanner.extract() function to accommodate a template with large size.

```
public UFS_STATUS ExtractEx(
    int nBufferSize,
    byte[] Template,
    out int TemplateSize,
    out int EnrollQuality
);
```

Parameters

- *nBufferSize [in]* : Template buffer size
- *pTemplate [out]* : Pointer to the template array; The array must be allocated in advance
- *pnTemplateSize [out]* : Receives the size (in bytes) of pTemplate
- *pnEnrollQuality [out]* : Receives the quality of enrollment; Quality value ranges from 1 to 100. Typically this value should be above 30 for further processing such as enroll and matching. Especially in case of enrollment, the use of good quality image (above 50) is highly recommended.

Return Values (refer to return values)

UFScanner.SetEncryptionKey

Sets encryption key.

```
public UFS_STATUS SetEncryptionKey(byte[] Key);
```

Parameters

- *pKey[out]* : Pointer to the 32 bytes key array; default key is first byte is 1 and second to 32th byte are all 0

Return Values (refer to return values)

UFScanner.EncryptTemplate

Encrypts template.

```
public UFS_STATUS EncryptTemplate(
    byte[] TemplateInput,
    int TemplateInputSize,
    byte[] TemplateOutput,
    ref int TemplateOutputSize
);
```

Parameters

- *hScanner [in]* : Handle to the scanner object
- *pTemplate [in]* : Pointer to input template data
- *pTemplateInputSize [in]* : Input template size
- *pTemplateOutput [out]* : Pointer to encrypted template data
- *pnTemplateOutputSize [in / out]* : Inputs allocated size of encrypted template data; Receives output template size

Return Values (refer to return values)

UFScanner.DecryptTemplate

Decrypts template.

```
public UFS_STATUS DecryptTemplate(
    byte[] TemplateInput,
    int TemplateInputSize,
    byte[] TemplateOutput,
    ref int TemplateOutputSize
);
```

Parameters

- *pTemplateInput [in]* : Pointer to input template data(encrypted)
- *nTemplateInputSize [in]* : Input template size
- *pTemplateOutput [out]* : Pointer to output template data
- *pnTemplateOutputSize [in / out]* : Inputs allocated size of output template data; Receives output template size

Return Values (refer to return values)

UFScanner.GetCaptureImageBufferInfo

Gets the information of the capture image buffer.

Parameters

- *pnWidth [out]* : Receives the width of the capture image buffer
- *pnHeight [out]* : Receives the height of the capture image buffer
- *pnResolution [out]* : Receives the resolution of the capture image buffer

Return Values (refer to return values)

UFScanner.GetCaptureImageBuffer

Copies the capture image buffer to the specified image data array.

```
public UFS_STATUS GetCaptureImageBuffer(
    out Bitmap bitmap,
    out int Resolution);
```

Parameters

- *pImageData [out]* : Pointer to image data array; The array must be allocated bigger than the size of capture image buffer in advance

Return Values (refer to return values)

UFScanner.GetCaptureImageBufferToBMPImageBuffer

Copies the capture image buffer to the specified image data of bmp format.

```
public UFS_STATUS GetCaptureImageBufferToBMPImageBuffer(
    byte[] imageData,
    out int nImageDataLength);
```

Parameters

- *pImageData [out]* : Pointer to bmp image data; The buffer must be allocated bigger than the size of capture image buffer in advance
- *pImageDataLength [out]* : pointer to bmp image data size

Return Values (refer to return values)

UFScanner.GetCaptureImageBufferTo19794_4ImageBuffer

Copies the capture image buffer to the specified image data of 19794_4 format.

```
public UFS_STATUS GetCaptureImageBufferTo19794_4ImageBuffer(
    byte[] imageData,
    out int nImageDataLength);
```

Parameters

- *pImageData [out]* : Pointer to 19794_4 format image data; The buffer must be allocated bigger than the size of capture image buffer in advance
- *pImageDataLength [out]* : pointer to 19794_4 format image data size

Return Values (refer to return values)

UFScanner.GetCaptureImageBufferToWSQImageBuffer

Copies the capture image buffer to the specified image data of the WSQ format.

```
public UFS_STATUS GetCaptureImageBufferToWSQImageBuffer(
    byte[] wsqData,
    out int TemplateSize,
    float ratio);
```

Parameters

- *ratio [in]* : Compression ratio of image
- *wsqData [out]* : Pointer to WSQ format image data; The buffer must be allocated bigger than the size of capture image buffer in advance
- *wsqDataLen [out]* : pointer to WSQ format image data size

Return Values (refer to return values)

UFScanner.GetCaptureImageBufferToWSQImageBufferVar

Copies the capture image buffer (cropped or expanded to the specified size) to the target image data buffer of the WSQ format.

```
public UFS_STATUS GetCaptureImageBufferToWSQImageBufferVar(
    byte[] wsqData,
    out int TemplateSize,
    float ratio,
    int nWidth,
    int nHeight
);
```

Parameters

- *Ratio [in]* : Compression ratio of image
- *wsqData [out]* : Pointer to WSQ format image data; The buffer must be allocated bigger than the size of capture image buffer in advance
- *wsqDataLen [out]* : pointer to WSQ format image data size
- *nWidth [in]* : Width to resize the capture image
- *nHeight [in]* : Height to resize the capture image

Return Values (refer to return values)

UFScanner.DecompressWSQBMP

Decompress WSQ file and save to BMP file.

```
public UFS_STATUS DecompressWSQBMP(
    string wsqFileName,
    string bmpFileName);
```

Parameters

- *wsqFile [in]* : Specifies file name to get wsq data buffer
- *bmpFile [in]* : Specifies file name to save image buffer

Return Values (refer to return values)

UFScanner.DecompressWSQBMPMem

Decompress WSQ buffer and save to image data of bmp format.

```
public UFS_STATUS DecompressWSQBMPMem(
    byte[] wsqBuffer,
    int wsqBufferLen,
    byte[] bmpBuffer,
    out int bmpBufferLen);
```

Parameters

- *wsqBuffer [in]* : Pointer to WSQ format image data
- *wsqBufferLen [in]* : Size of WSQ format image data
- *bmpBuffer [out]* : Pointer to bmp image data; The array must be allocated bigger than the size of capture image buffer in advance.
- *bmpBufferLen [out]* : pointer to bmp image data size

Return Values (refer to return values)

UFScanner.DrawCaptureImageBuffer

Draws the fingerprint image which is acquired using UFScanner.CaptureSingleImage() or UFScanner.StartCapturing(). This function is not supported on java.

```
public UFS_STATUS DrawCaptureImageBuffer(
    Graphics g,
    Rectangle rect,
    bool DrawCore);
```

Parameters

- *hDC [in]* : Handle to the DC where the fingerprint image is drawn
- *nLeft [in]* : Specifies the logical x-coordinate of the upper-left corner of the rectangle
- *nTop [in]* : Specifies the logical y-coordinate of the upper-left corner of the rectangle
- *nRight [in]* : Specifies the logical x-coordinate of the lower-right corner of the rectangle
- *nBottom [in]* : Specifies the logical y-coordinate of the lower-right corner of the rectangle
- *bCore [in]* : Specifies whether the core of fingerprint is drawn of not

Return Values (refer to return values)

UFScanner.DrawFeatureBuffer

Draws the fingerprint image which is acquired using UFScanner.CaptureSingleImage() or UFScanner.StartCapturing(). This function is not supported on java and should be called after the extraction from the last captured fingerprint image. If extraction is not performed from the last captured image, this function will not draw the feature in the image frame.

```
public UFS_STATUS DrawFeatureBuffer(
    Graphics g,
    Rectangle rect,
    bool DrawCore);
```

Parameters

- *hDC [in]* : Handle to the DC where the fingerprint image is drawn
- *nLeft [in]* : Specifies the logical x-coordinate of the upper-left corner of the rectangle
- *nTop [in]* : Specifies the logical y-coordinate of the upper-left corner of the rectangle
- *nRight [in]* : Specifies the logical x-coordinate of the lower-right corner of the rectangle
- *nBottom [in]* : Specifies the logical y-coordinate of the lower-right corner of the rectangle
- *bCore [in]* : Specifies whether the core of fingerprint is drawn of not

Return Values (refer to return values)

UFScanner.SaveCaptureImageBufferToBMP

Saves the capture image buffer to the specified file of the bitmap format.

```
public UFS_STATUS SaveCaptureImageBufferToBMP(
      string FileName
);
```

Parameters

- *szFileName [in]* : Specfies file name to save image buffer

Return Values (refer to return values)

UFScanner.SaveCaptureImageBufferTo19794_4

Saves the capture image buffer to the specified file of the 19794_4 format.

```
public UFS_STATUS SaveCaptureImageBufferTo19794_4(
      string FileName
);
```

Parameters

- *szFileName [in]* : Specifies file name to save image buffer

Return Values (refer to return values)

UFScanner.SaveCaptureImageBufferToWSQ

Saves the capture image buffer to the specified file of the WSQ format.

```
public UFS_STATUS SaveCaptureImageBufferToWSQ(
    string FileName,
    float ratio);
```

Parameters

- *ratio [in]* : Compression ratio of image
- *szFileName [in]* : Specifies file name to save image buffer

Return Values (refer to return values)

UFScanner.SaveCaptureImageBufferToWSQVar

Saves the capture image buffer (cropped or expanded to the specified size) to the target file of the WSQ format.

```
public UFS_STATUS SaveCaptureImageBufferToWSQVar(
    string FileName,
    float ratio,
    int nWidth,
    int nHeight );
```

Parameters

- *ratio [in]* : Compression ratio of image
- *szFileName [in]* : Specfies file name to save image buffer
- *nWidth [in]* : Width to resize the capture image
- *nHeight [in]* : Height to resize the capture image

Return Values (refer to return values)

UFScanner.ClearCaptureImageBuffer

Clears the capture image buffer stored to the internal buffer.

```
public UFS_STATUS ClearCaptureImageBuffer();
```

Return Values (refer to return values)

UFScanner.GetErrorString

Gets the error string for specified UFScanner.STATUS() value.

```
public static UFS_STATUS GetErrorString(
    UFS_STATUS res,
    out string ErrorString);
```

Parameters

- *szErrorString [out]* : Receives error string

Return Values (refer to return values)

UFScanner.GetTemplateType

Gets the template type value.

Parameters

- *pValue [out]* : Receives the parameter value of specified parameter type; 'pValue' must point to adequate type that is matched with the parameter type

Template type	Code	Description
UFS_TEMPLATE_TYPE_SUPREMA	2001	Suprema template type
UFS_TEMPLATE_TYPE_ISO19794_2	2002	ISO template type
UFS_TEMPLATE_TYPE_ANSI378	2003	ANSI378 template type

Return Values (refer to return values)

UFScanner.SetTemplateType

Sets the template type value.

Parameters

- *nTemplateType [in]* : Parameter type; one of template type

Template type	Code	Description
UFS_TEMPLATE_TYPE_SUPREMA	2001	Suprema template type
UFS_TEMPLATE_TYPE_ISO19794_2	2002	ISO template type
UFS_TEMPLATE_TYPE_ANSI378	2003	ANSI378 template type

Return Values (refer to return values)

UFScanner.SelectTemplate

Selects n number of good templates from m number of input templates.

Parameters

- *ppTemplateInput [in]* : Array pointer to the input template arrays
- *pnTemplateInputSize [in]* : Array pointer to input templates'size
- *nTemplateInputNum [in]* : Number of input templates
- *ppTemplateOutput [out]* : Array pointer to the output template arrays
- *pnTemplateOutputSize [out]* : Array pointer to the output templates'size
- *nTemplateOutputNum [in]* : Number of output templates; should be less than input template number by more than one

Return Values (refer to return values)

UFScanner.SelectTemplateEx

Selects n number of good templates from m number of input templates This is extended version of UFScanner.SelectTemplate() function to accommodate the template with large size.

Parameters

- *nBufferSize [in]* : Template buffer size
- *ppTemplateInput [in]* : Array pointer to the input template arrays
- *pnTemplateInputSize [in]* : Array pointer to the input templates'size
- *nTemplateInputNum [in]* : Number of input templates
- *ppTemplateOutput [out]* : Array pointer to the output template arrays
- *pnTemplateOutputSize [out]* : Array pointer to the output templates'size
- *nTemplateOutputNum [in]* : Number of output templates; should be less than input template number by more than one

Return Values (refer to return values)

UFScanner.GetFPQuality

Calculates the quality score of an image as defined in NISTIR 7151: FingerPrint Image Quality. The score would be between 1(excellent) and 5(poor).

```
public UFS_STATUS GetFPQuality(
    byte[] fpImageData,
    int nWidth,
    int nHeight,
    out int nFPQuality);
```

Parameters

- *fpImageData[in]* : Raw capture image data
- *nWidth [in]* : Width of capture image data
- *nHeight [in]* : Height of capture image data
- *nFPQuality[in]* : NIST quality score of image data

Return Values (refer to return values)

UFScanner.GetFeatureNumber

Get the number of Minutiae from the template data.

```
public UFS_STATUS GetFeatureNumber(
    byte[] Template,
    int TemplateSize,
    out int FeatureNumber);
```

Parameters

- *pTemplate [in]* : Template data
- *nTemplateSize [in]* : Size of template data
- *pnFeatureNum [out]* : The number of minutiae from pTemplate

Return Values (refer to return values)

UFScanner.EnrollUI

Generate the fingerprint enrollment dialog. This function can be called after executing UFS_Init. Enrolling a fingerprint is extracting a template from finger and saving the template. Below sample's UFS_EnrollUI function captures a fingerprint image after setting the template type. And extracts a template from captured fingerprint image. The extracted template will be saved in a specific template array, which is a parameter of the UFS_EnrollUI function. It supported only for Windows environment.

*Constraints
– You should have 'img' folder to use graphical backgrounds and buttons. The application uses the img folder should be at the upper level folder. For example, if the application is at the /bin/sample, 'img' folder should be at the location of /bin/sample/img.
– Enrollment UI is based on COM interface. Thus you should register dll file before use. You can use the pre-coded script (register_enrollui.bat) to register the dll file, or simple type the command 'regsvr32.exe IEnrollUI.dll' at the command prompt.

```
public Suprema.UFS_STATUS EnrollUI(
      int nTimeout,
      int nOptions,
      byte[] pUF_FIR_Buf,
      int[] pUF_FIR_Buf_Len,
      byte[] pISO_FIR_Buf,
      int[] pISO_FIR_Buf_Len,
      byte[] pImages_Path,
      byte[] pImages_buf,
      int[] pImages_Buf_Len);
```

Parameters

- *nTimeout [in]* : Timeout of the capture
- *nOptions [in]* : Options for enrollment. Matching level, image Quality, number of fingerprints for enrollment, number of templates per finger
- *pUF_FIR_Buf [out]* : Pointer to the byte array for suprema template. This data pointer is assigned by maximum 1024*20
- *pUF_FIR_Buf_Len [out]* : Pointer to the int array for length of suprema template buffer
- *pISO_FIR_Buf [out]* : Pointer to the byte array for ISO template. This data pointer is assigned by maximum 1024 * 20
- *pISO_FIR_Buf_Len [out]* : Pointer to the int array for length of ISO template buffer
- *pImages_Path [in]* : Path to captured images to be saved. If NULL value is passed, nothing will be saved
- *pImage_Buf [out]* : Pointer to the byte array for image buffer. This data pointer is assigned by maximum 320 * 480
- *pImage_Buf_Len [out]* : Pointer to the int array for length of image buffer

Return Values (refer to return values)

UFScanner.VerifyUI

Generate the fingerprint verification dialog. This function can be called after executing UFS_Init and UFS_EnrollUI. Two fingerprints can be verified whether they are matched or not. Below sample's UFS_VerifyUI function captures a fingerprint image and extracts a template from the image. And execute 1:1 matching using extracted template and templates enrolled from UFS_EnrollUI.

*Constraints
– Refer to the UFS_EnrollUI constraints.

```
public Suprema.UFS_STATUS VerifyUI(
      int nTimeout,
      int nOptions,
      int nFPTemplateType,
      byte[] pFIR_Buf,
      int[] pFIR_Buf_Len,
      byte[] pImage_Name,
      out int nFingerIndex);
```

Parameters

- *nTimeout [in]* : Timeout of the capture
- *nOptions [in]* : Options for enrollment. Matching level, image Quality, number of fingerprints for enrollment, number of templates per finger
- *nFPTemplateType [in]* : Template type for matching enrolled templates with captured fingerprint
- *pFIR_Buf [out]* : Pointer to the byte array for template
- *pFIR_Buf_Len [out]* : Pointer to the int array for length of template buffer
- *pImage_Name[in]* :
- *nFingerIndex [in]* : Matched finger index from enrolled templates. If this value is -1, the matching result is failed

UFMatcher.Create

Creates a matcher object.

Parameters

- *phMatcher [out]* : Pointer to handle of the matcher object

Return Values (refer to return values)

UFMatcher.Delete

Deletes specified matcher object.

Return Values (refer to return values)

UFMatcher.GetParameter

Gets parameter value of UFMatcher module.

Parameters

- *nParam [in]* : Parameter type; one of parameters

Parameter	Code	Description	Default value
UFM_PARAM_FAST_MODE	301	Fast Mode (0: not use fast mode, 1: use fast mode)	1
UFM_PARAM_SECURITY_LEVEL	302	Set the False Accept Ratio(FAR) (1: Below 1%, 2: Below 0.1%, 3: Below 0.01%, 4: Below 0.001%, 5: Below 0.0001%, 6: Below 0.00001%, 7: Below 0.000001%)	4
UFM_PARAM_USE_SIF	311	Use SIF (0: not use SIF, 1: use SIF)	0
UFM_PARAM_AUTO_ROTATE	321	Rotate Mode(0: not use rotate mode, 1: use rotate mode)	0
UFM_PARAM_SDK_VERSION	210	SDK Version (get only)	-
UFM_PARAM_SDK_COPYRIGHT	211	SDK Copyright (get only)	

- *pValue [out]* : Receives parameter value of specified parameter type; pValue must point to adequate storage type matched to parameter type

Return Values (refer to return values)

UFMatcher.SetParameter

Sets parameter value of UFMatcher module.

Parameters

- *nParam [in]* : Parameter type; one of parameters

Parameter	Code	Description	Default value
UFM_PARAM_FAST_MODE	301	Fast Mode (0: not use fast mode, 1: use fast mode)	1
UFM_PARAM_SECURITY_LEVEL	302	Set the False Accept Ratio(FAR) (1: Below 1%, 2: Below 0.1%, 3: Below 0.01%, 4: Below 0.001%, 5: Below 0.0001%, 6: Below 0.00001%, 7: Below 0.000001%)	4
UFM_PARAM_USE_SIF	311	Use SIF (0: not use SIF, 1: use SIF)	0
UFM_PARAM_AUTO_ROTATE	321	Rotate Mode(0: not use rotate mode, 1: use rotate mode)	0
UFM_PARAM_SDK_VERSION	210	SDK Version (get only)	-
UFM_PARAM_SDK_COPYRIGHT	211	SDK Copyright (get only)	

- *pValue [in]* : Pointer to parameter value of specified parameter type; pValue must point to adequate storage type matched to parameter type

Return Values (refer to return values)

UFMatcher.Verify

Compares two extracted templates.

```
public Suprema.UFM_STATUS Verify(
    byte[] Template1,
    int Template1Size,
    byte[] Template2,
    int Template2Size,
    out bool VerifySucceed
);
```

Parameters

- *pTemplate1 [in]* : Pointer to the template1
- *nTemplate1Size [in]* : Specifies the size of the template1
- *pTemplate2 [in]* : Pointer to the template2
- *nTemplate2Size [in]* : Specifies the size of the template2
- *bCerifySucceed [out]* : Receives, whether verification is succeed; 1: verification is succeed, 0: verification is failed

Return Values (refer to return values)

UFMatcher.Identify, UFM_IdentifyMT

Compares a template with given template array. UFM_IdentifyMT function uses multi threads internally for faster identifying in multi-core systems.

Parameters

- *pTemplate1 [in]* : Pointer to the template
- *nTemplate1Size [in]* : Specifies the size of the template
- *ppTemplate2 [in]* : Pointer to the template array
- *pnTemplate2Size [in]* : Pointer to the template size array
- *nTemplate2Num [in]* : Specifies the number of templates in the template array
- *nTimeout [in]* : Specifies maximum time for identifying in milliseconds; If elapsed time for identifying exceeds nTimeout, function stops further identifying and returns UFM_ERR_MATCH_TIMEOUT; 0 means infinity
- *pnMatchTemplate2Index [out]* : Receives the index of matched template in the template array; -1 means pTemplate1 is not matched to all of templates in ppTemplate2

Return Values (refer to return values)

UFMatcher.AbortIdentify

Aborts current identifying procedure started using UFMatcher.Identify(),IdentifyMT().

Return Values (refer to return values)

UFMatcher.IdentifyInit

Initializes identify with input template.

```
public Suprema.UFM_STATUS IdentifyInit(
      byte[] Template1,
      int Template1Size
);
```

Parameters

- *pTemplate1 [in]* : Pointer to the template
- *nTemplate1Size [in]* : Specifies the size of the template

Return Values (refer to return values)

UFMatcher.IdentifyNext

Matches one input template to the template specified in UFMatcher.IdentifyInit().

```
public Suprema.UFM_STATUS IdentifyNext(
    byte[] Template2,
    int Template2Size,
    out bool IdentifySucceed)
};
```

Parameters

- *pTemplate2 [in]* : Pointer to the template array
- *nTemplate2Size [in]* : Specifies the size of the template array
- *bIdentifySucceed [out]* : Receives whether identification is succeed; 1: identification is succeed, 0: identification is failed

Return Values (refer to return values)

UFMatcher.RotateTemplate

Rotates the specified template to the amount of 180 degrees.

```
public Suprema.UFM_STATUS RotateTemplate(byte[] Template, int TemplateSize);
```

Parameters

- *pTemplate [in / out]* : Pointer to the template
- *nTemplateSize [in]* : Specifies the size of the template

Return Values (refer to return values)

UFMatcher.GetErrorString

Gets the error string for the specified UFMatcher.STATUS() value.

```
public static Suprema.UFM_STATUS GetErrorString(
    Suprema.UFM_STATUS res,
    out string ErrorString
);
```

Parameters

- *res [in]* : Status return value
- *szErrorString [out]* : Receives error string

Return Values (refer to return values)

UFMatcher.GetTemplateType

Gets the parameter value.

Parameters

- *pValue [out]* : Receives parameter value of specified parameter type; pValue must point to adequate storage type matched to template type

Template type	Code	Description
UFM_TEMPLATE_TYPE_SUPREMA	2001	Suprema template type
UFM_TEMPLATE_TYPE_ISO19794_2	2002	ISO template type
UFM_TEMPLATE_TYPE_ANSI378	2003	ANSI378 template type

Return Values (refer to return values)

UFMatcher.SetTemplateType

Gets parameter value.

Parameters

- *nTemplateType [in]* : Parameter type; one of template type

Template type	Code	Description
UFM_TEMPLATE_TYPE_SUPREMA	2001	Suprema template type
UFM_TEMPLATE_TYPE_ISO19794_2	2002	ISO template type
UFM_TEMPLATE_TYPE_ANSI378	2003	ANSI378 template type

Return Values (refer to return values)

UFScanner.STATUS

Every function in a UFScanner module returns UFS_OK when it succeeds. When it fails, it returns a value corresponding to a error code. Please find the error code on the followings if you'd like to know the information about the UFS_STATUS (integer) value.

Code	Value	Description
UFS_OK	0	Success
UFS_ERROR	-1	General error
UFS_ERR_NO_LICENSE	-101	Device is not connected or License is not located
UFS_ERR_LICENSE_NOT_MATCH	-102	License does not match
UFS_ERR_LICENSE_EXPIRED	-103	License has expired
UFS_ERR_NOT_SUPPORTED	-111	This function is not supported
UFS_ERR_INVALID_PARAMETERS	-112	Input parameters are invalid
UFS_ERR_ALREADY_INITIALIZED	-201	Module is already initialized
UFS_ERR_NOT_INITIALIZED	-202	Module is not initialized
UFS_ERR_DEVICE_NUMBER_EXCEED	-203	Device number exceeds
UFS_ERR_LOAD_SCANNER_LIBRARY	-204	Error on loading the library of a scanner
UFS_ERR_CAPTURE_RUNNING	-211	Capturing is started using UFS_CaptureSingleImage or UFS_StartCapturing
UFS_ERR_CAPTURE_FAILED	-212	Capturing is timeout or aborted
UFS_ERR_NOT_GOOD_IMAGE	-301	Input image is not good
UFS_ERR_EXTRACTION_FAILED	-302	Extraction is failed
UFS_ERR_CORE_NOT_DETECTED	-351	Core is not detected
UFS_ERR_CORE_TO_LEFT_TOP	-353	Move finger to left-top
UFS_ERR_CORE_TO_TOP	-354	Move finger to top
UFS_ERR_CORE_TO_RIGHT_TOP	-355	Move finger to right-top
UFS_ERR_CORE_TO_RIGHT	-356	Move finger to right
UFS_ERR_CORE_TO_RIGHT_BOTTOM	-357	Move finger to right-bottom
UFS_ERR_CORE_TO_BOTTOM	-358	Move finger to bottom
UFS_ERR_CORE_TO_LEFT_BOTTOM	-359	Move finger to left-bottom

UFMatcher.STATUS

Every function in a UFMatcher module returns UFM_OK when it succeeds. When it fails, it returns a value corresponding to a error code. Please find the error code on the followings if you'd like to know the information about the UFM_STATUS (integer) value.

Code	Value	Description
UFM_OK	0	Success
UFM_ERROR	-1	General error
UFM_ERR_NO_LICENSE	-101	System has no license
UFM_ERR_LICENSE_NOT_MATCH	-102	License does not match
UFM_ERR_LICENSE_EXPIRED	-103	License has expired
UFM_ERR_NOT_SUPPORTED	-111	This function is not supported
UFM_ERR_INVALID_PARAMETERS	-112	Input parameters are invalid
UFM_ERR_MATCH_TIMEOUT	-401	Matching is timeout
UFM_ERR_MATCH_ABORTED	-402	Matching is aborted
UFM_ERR_TEMPLATE_TYPE	-411	Template type does not match

5. JAVA Development

5.1 Environment Setting

You need the following packages installed BioMini SDK, JAVA SDK 1.4 or higher, JNI package file (“BioMiniSDK.jar” is at the following location “<BioMini SDK installed path>\bin\java”)

1. Install Java SDK

You must install Java SDK 1.4 or higher version.
For more information, please see http://www.oracle.com.

2. Set Classpath

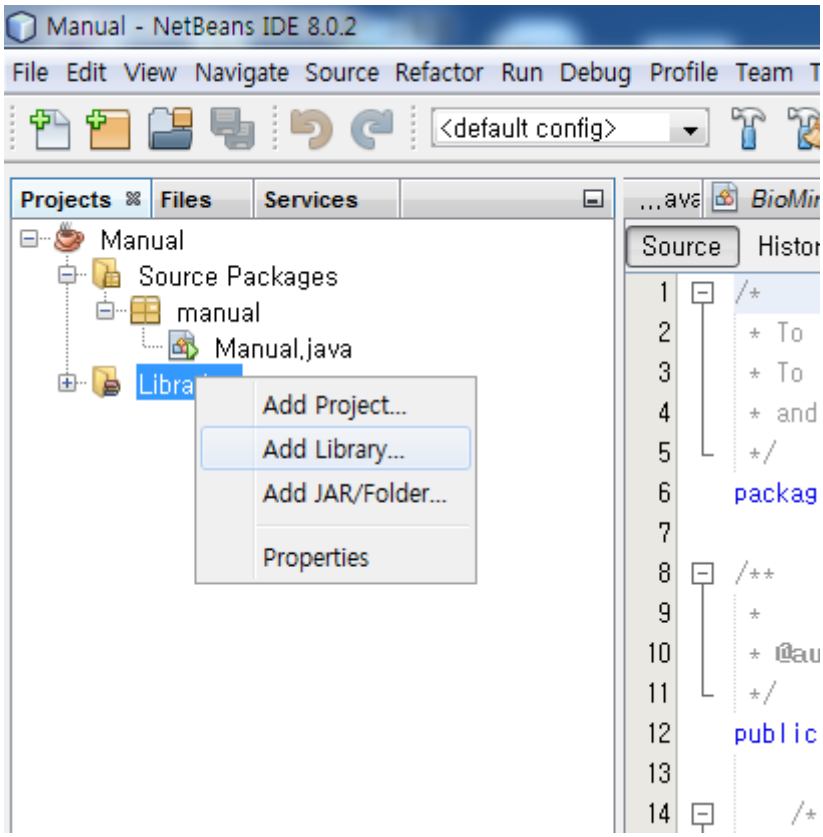
After java sdk installation, you must set classpath as following example.
“CLASSPATH=.;<path to the BioMiniSDK.jar file>;”

3. Build and run sample

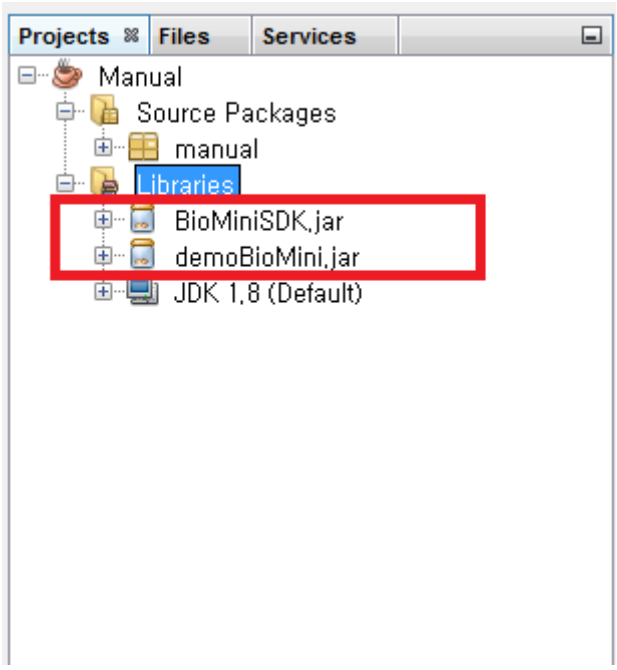
You can build and run the JNI demo application in the following location.
<BioMini SDK installed folder>\samples\java\demoBioMini.java

Setting Guide

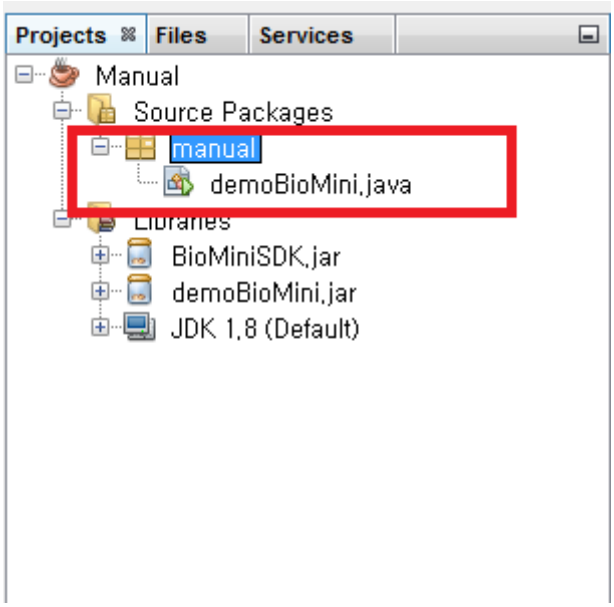
1. After creating the project, select “Add JAR?Folder…” by using right mouse button from the Library.



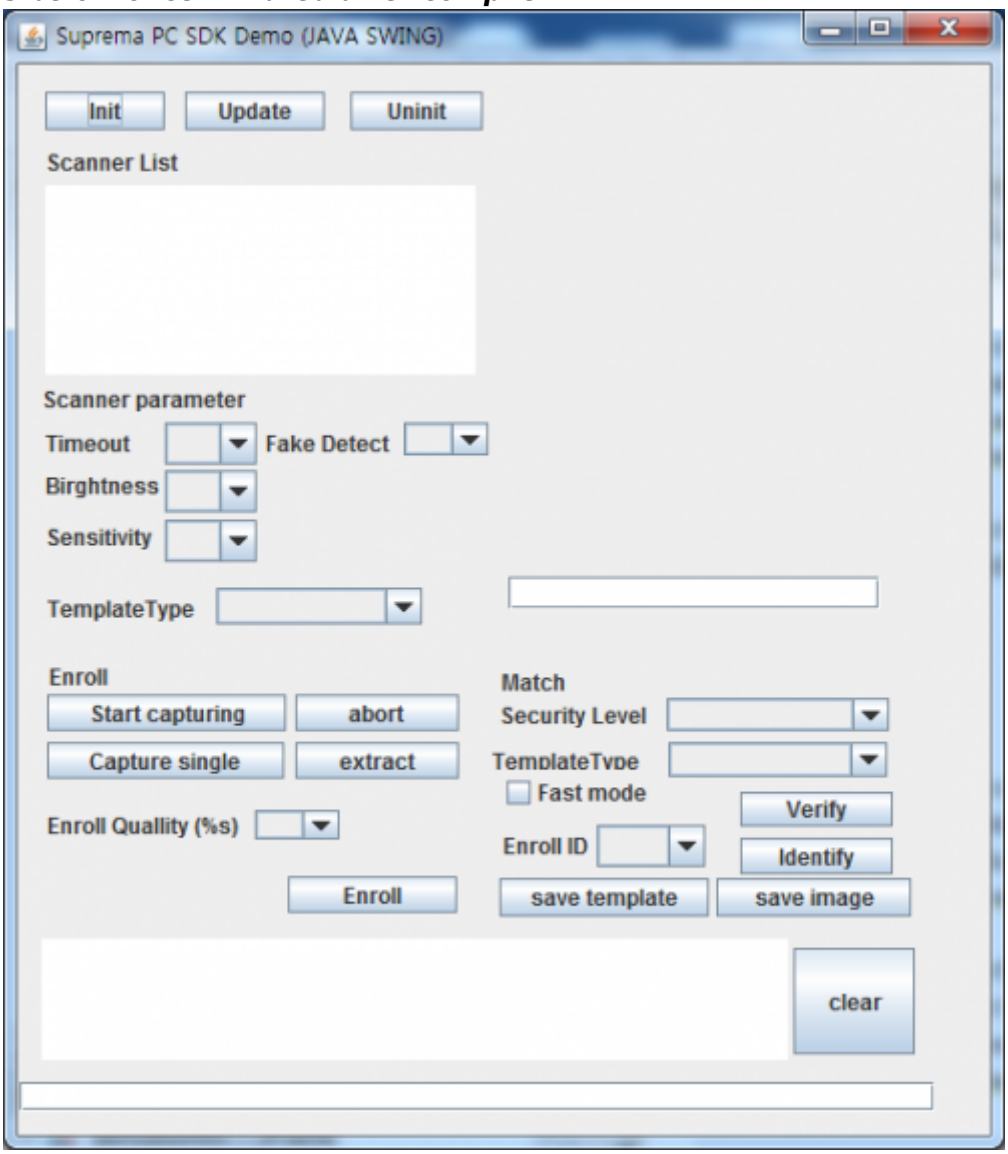
2. Add BioMiniSDK.jar & demoBioMini.jar from the bin folder as below.



3. Add /SDK_Dir/samples/java\demoBioMini.java file to the source packages



4. Can run as below once initiated after compile.



5.2 Java APIs

The Java API is built as a wrapper to the JNI. The Java API is available for Windows. This page provides an overview of the API. For details of using the API on a specific reader platform, consult the appropriate Platform Guide.

UFS_Init()
: Initializes a UFScanner module

UFS_Update()
: Enforces a UFScanner module to update the connection state of scanners

UFS_Uninit()
: Un-initializes a UFScanner module

UFS_SetScannerCallback()
: Registers a scanner callback function

UFS_RemoveScannerCallback()
: Removes a registered scanner callback function

UFS_GetScannerNumber()
: Gets the number of scanners

UFS_GetScannerHandle()
: Gets the scanner handle using the scanner index

UFS_GetScannerHandleByID()
: Gets the scanner handle using a scanner ID

UFS_GetScannerIndex()
: Gets the scanner index that is assigned to the scanner handle

UFS_GetScannerID()
: Gets a scanner ID that is assigned to the scanner handle

UFS_GetScannerType()
: Gets the scanner type that is assigned to the scanner handle

UFS_GetParameter()
: Gets the parameter value of a UFScanner module

UFS_SetParameter()
: Sets the parameter value of a UFScanner module

UFS_IsSensorOn()
: Checks whether a scanner is connected or not

UFS_IsFingerOn()
: Checks whether a finger is placed on a scanner or not

UFS_CaptureSingleImage()
: Captures single image. Captured image is stored to the internal buffer

UFS_StartCapturing()
: Starts capturing. The capture is going on until the specified time exceeds

UFS_StartAutoCapture()
: Starts the automatic capture. Currently this function is working for Suprema SFR600(BioMini Slim) only

UFS_IsCapturing()
: Checks if the specified scanner is running to capture which is started by UFS_CaptureSingleImage or UFS_StartCapturing

UFS_AbortCapturing()
: Aborts capturing which is started by UFS_CaptureSingleImage() or UFS_StartCapturing()

UFS_Extract()
: Extracts a template from the stored image buffer which is acquired using UFS_CaptureSingleImage() or UFS_StartCapturing()

UFS_ExtractEx()
: Extracts a template from the stored image buffer which is acquired using UFS_CaptureSingleImage() or UFS_StartCapturing().This is extended version of UFS_Extract() function to accommodate a template with large size

UFS_SetEncryptionKey()
: Sets the encryption key

UFS_EncryptTemplate()
: Encrypts a template

UFS_DecryptTemplate()
: Decrypt a template

UFS_GetCaptureImageBufferInfo()
: Gets the information of the capture image buffer

UFS_GetCaptureImageBuffer()
: Copies the capture image buffer to the specified image data array

UFS_GetCaptureImageBufferToBMPImageBuffer()
: Copies the capture image buffer to the specified image data of bmp format

UFS_GetCaptureImageBufferTo19794_4ImageBuffer()

Copies the capture image buffer to the specified image data of 19794_4 format

UFS_GetCaptureImageBufferToWSQImageBuffer()
Copies the capture image buffer to the specified image data of the WSQ format

UFS_GetCaptureImageBufferToWSQImageBufferVar()
Copies the capture image buffer (cropped or expanded to the specified size) to the target image data buffer of the WSQ format

UFS_DecompressWSQBMP()
Decompress a WSQ file and save to a BMP file

UFS_DecompressWSQBMPMem()
Decompress a WSQ buffer and save to the image data of the bmp format

UFS_SaveCaptureImageBufferToBMP()
Saves the capture image buffer to the specified file of the bitmap format

UFS_SaveCaptureImageBufferTo19794_4()
Saves the capture image buffer to the specified file of the 19794_4 format

UFS_SaveCaptureImageBufferToWSQ()
Saves the capture image buffer to the specified file of the WSQ format

UFS_SaveCaptureImageBufferToWSQVar()
Saves the capture image buffer (cropped or expanded to the specified size) to the target file of the WSQ format

UFS_ClearCaptureImageBuffer()
Clears the capture image buffer stored to the internal buffer

UFS_GetErrorString()
Gets the error string for specified UFS_STAUS value

UFS_GetTemplateType()
Gets the template type value

UFS_SetTemplateType()
Sets the template type value

UFS_SelectTemplate()
Selects n number of good templates from m number of input templates

UFS_SelectTemplateEx()
Selects n number of good templates from m number of input templates This is extended version of UFS_SelectTemplate function to accommodate the template with large size

UFS_GetFPQuality()
Calculates the quality score of an image as defined in NISTIR 7151: FingerPrint Image Quality. The score would be between 1(excellent) and 5(poor)

UFS_GetFeatureNumber()
: Get number of Minutiae from template data

UFM_Create()
: Creates a matcher object

UFM_Delete()
: Deletes a specified matcher object

UFM_GetParameter()
: Gets the parameter value of UFMatcher module

UFM_SetParameter()
: Sets the parameter value of UFMatcher module

UFM_Verify()
: Compares two extracted templates

UFM_Identify(),IdentifyMT()
: Compares a template with given template array UFM_IdentifyMT() function uses multi threads internally for faster identifying in multi-core systems

UFM_AbortIdentify()
: Aborts current identifying procedure started using UFM_Identify()

UFM_IdentifyInit()
: Initializes identify with input template

UFM_IdentifyNext()
: Matches one input template to the template specified in UFM_IdentifyInit()

UFM_RotateTemplate()
: Rotates the specified template to the amount of 180 degrees

UFM_GetErrorString()
: Gets the error string for the specified UFM_STAUS value

UFM_GetTemplateType()
: Gets the parameter value

UFM_SetTemplateType()
: Sets the parameter value

UFS_Init

Initializes a UFScanner module.

```
int UFS_Init();
```

Examples

```
int nRes =;
BioMiniSDK p = null;

//make instance
p = new BioMiniSDK();

nRes = p.UFS_Init();

if(nRes ==p.UFS_OK)
{
   // UFS_Init is succeeded
}
else
{
   // UFS_Init is failed
   // Use UFS_GetErrorString method to show error string
}
```

Return Values(refer to return values)

UFS_Update

Enforces a UFScanner module to update the connection state of scanners.

```
int UFS_Update();
```

Examples

```
int ufs_res;

//make class library instance(BioMiniSDK p)

ufs_res = p.UFS_Update();
if (ufs_res == p.UFS_OK)
{
   // UFS_Update is succeeded
}
else
{
   // UFS_Update is failed
   // Use UFS_GetErrorString function to show error string
}
```

Return Values(refer to return values)

UFS_Uninit

Un-initializes a UFScanner module.

```
int UFS_UnInit();
```

Examples

```
int ufs_res;

//make class library instance(BioMiniSDK p)

ufs_res = p.UFS_Uninit();
if (ufs_res == p.UFS_OK)
{
   // UFS_Uninit is succeeded
}
else
{
   // UFS_Uninit is failed
   // Use UFS_GetErrorString function to show error string
}
```

Return Values(refer to return values)

UFS_SetScannerCallback

Registers the scanner callback function.

```
int UFS_SetScannerCallback(
      String nCallbackFunctionName);
```

Parameters

- *nCallbackFunctionName[in]* :

Examples

```
// Define scanner procedure

public void scannerCallback(char[] szScannerID, int bSensorOn)
{
   // ...
}

// Set parameter, the name of call function for scanner event (USB Plug)
//make class library instance(BioMiniSDK p)

ufs_res = p.UFS_SetScannerCallback("scannerCallback");
if(ufs_res==p.UFS_OK)
{
   // UFS_SetScannerCallback is succeeded
}
else
{
   // UFS_SetScannerCallback is failed
   // Use UFS_GetErrorString function to show error string
}
```

Return Values(refer to return values)

UFS_RemoveScannerCallback

Removes the registered scanner callback function.

```
int UFS_RemoveScannerCallback();
```

Examples

```
int ufs_res;

//make class library instance(BioMiniSDK p)
ufs_res = p.UFS_RemoveScannerCallback();
if (ufs_res == UFS_OK)
{
   // UFS_RemoveScannerCallback is succeeded
}
else
{
   // UFS_RemoveScannerCallback is failed
   // Use UFS_GetErrorString function to show error string
}
```

Return Values(refer to return values)

UFS_GetScannerNumber

Gets the number of scanners.

```
int UFS_GetScannerNumber(
      int[] pnScannerNumber );
```

Parameters

- *pnScannerNumber [out]* : Receive the number of scanners

Examples

```
int ufs_res;
int[] nNumber = new int[1];

//make class library instance(BioMiniSDK p)

ufs_res = p.UFS_GetScannerNumber(nNumber);
if (ufs_res == UFS_OK)
{
   // UFS_GetScannerNumber is succeeded
   nNumber[1] ...
}
else
{
   // UFS_GetScannerNumber is failed
   // Use UFS_GetErrorString function to show error string
}
```

Return Values(refer to return values)

UFS_GetScannerHandle

Gets the scanner handle using a scanner index.

```
int UFS_GetScannerHandle(
      int nScannerIndex,
      long[] phScanner );
```

Parameters

- *nScannerIndex [in]* : Scanner index (0 ~ number of scanners - 1)
- *phScanner [out]* : Pointer to handle of the scanner object

Examples

```
int ufs_res;
long[] hScanner = new long[1];
int index = ;

// Set nScannerIndex to (0 ~ number of scanners - 1 )
// Number of scanner can be retrieved using UFS_GetScannerNumber function
//make class library instance(BioMiniSDK p)

ufs_res = p.UFS_GetScannerHandle(index, hScanner);
if (ufs_res == UFS_OK)
{
   // UFS_GetScannerHandle is succeeded
   // hScanner[0] is the handle
}
else
{
   // UFS_GetScannerHandle is failed
   // Use UFS_GetErrorString function to show error string
}
```

Return Values(refer to return values)

UFS_GetScannerHandleByID

Gets the scanner handle using a scanner ID.

```
int UFS_GetScannerHandleByID(
      String szScannerID,
      long[] phScanner );
```

Parameters

- *szScannerID [in]* : Scanner ID
- *phScanner [out]* : Pointer to handle of the scanner object

Return Values(refer to return values)

UFS_GetScannerIndex

Gets a scanner index that is assigned to the scanner handle.

```
int UFS_GetScannerIndex(
      long hScanner,
      int[] pnScannerIndex );
```

Parameters

- *hScanner [in]* : Handle to the scanner object
- *pnScannerIndex [out]* : Receive scanner index of specified scanner handle

Return Values(refer to return values)

UFS_GetScannerID

Gets scanner ID assigned to scanner handle.

```
int UFS_GetScannerID(
      long hScanner,
      byte[] szScannerID );
```

Parameters

- *hScanner [in]* : Handle to the scanner object
- *szScannerID [out]* : Receive scanner ID of specified scanner handle; Scanner ID has maximum 32 characters. szScannerID must be allocated in user's applications and allocated size must be larger than 33 bytes for considering null character in 33th byte position.

Examples

```
int ufs_res;
long[] hScanner = new long[1];
byte[] strID = new byte[128];

 // Should be larger than 33 bytes
// make class library instance(BioMiniSDK p)
// Get hScanner handle

ufs_res = p.UFS_GetScannerID(hScanner[], strID);
if (ufs_res == p.UFS_OK)
{
   // UFS_GetScannerID is succeeded
   // byte to string..
}
else
{
   // UFS_GetScannerID is failed
   // Use UFS_GetErrorString function to show error string
}
```

Return Values(refer to return values)

UFS_GetScannerType

Gets the scanner type that is assigned to the scanner handle.

```
int UFS_GetScannerType(
      long hScanner,
      int[] pnScannerType );
```

Parameters

- *hScanner [in]* : Handle to the scanner object
- *pnScannerType [out]* : Receives one of the scanner type

Scanner type	Code	Description
UFS_SCANNER_TYPE_SFR200	1001	Suprema SFR200
UFS_SCANNER_TYPE_SFR300	1002	Suprema SFR300-S
UFS_SCANNER_TYPE_SFR300v2	1003	Suprema SFR300v2, SFR400
UFS_SCANNER_TYPE_SFR500	1004	Suprema SFR500
UFS_SCANNER_TYPE_SFR600	1005	Suprema SFR600
UFS_SCANNER_TYPE_SFR410	1006	Suprema SFR410
UFS_SCANNER_TYPE_SFR550	1007	Suprema SFR550

Examples

```
int ufs_res;
long[] hScanner = new long[1];
int[] nScannerType = new int[1];

// make class library instance(BioMiniSDK p)

// Get hScanner handle

ufs_res = p.UFS_GetScannerType(hScanner[], nScannerType);
if (ufs_res == UFS_OK)
{
   // UFS_GetScannerType is succeeded
   // nScannerType[0] is the scanner type
}
else
{
   // UFS_GetScannerType is failed
   // Use UFS_GetErrorString function to show error string
}
```

Return Values(refer to return values)

UFS_GetParameter

Gets parameter value of UFScanner module.

```
int UFS_GetParameter(
      long hScanner,
      int nParam,
      int[] pValue );
```

Parameters

- *hScanner [in]* : Handle to the scanner object
- *nParam [in]* : Parameter type; one of parameters

Parameter	Code	Description	Default value
UFS_PARAM_TIMEOUT	201	Timeout (millisecond unit) (0: infinite)	5000
UFS_PARAM_BRIGHTNESS	202	Brightness (0 ~ 255); Higher value means darker image. * Not supported Device: BioMini-Slim(SFU-S20, SFU-S20B) BioMini(SFU-300)	100
UFS_PARAM_SENSITIVITY	203	Sensitivity (0 ~ 7); Higher value means more sensitive	4
UFS_PARAM_SERIAL	204	Serial (get only)	-
UFS_PARAM_SDK_VERSION	210	SDK Version (get only)	
UFS_PARAM_SDK_COPYRIGHT	211	SDK Copyright (get only)	
UFS_PARAM_DETECT_CORE	301	Detect core (0: not use core, 1: use core)	0
UFS_PARAM_TEMPLATE_SIZE	302	Template size (byte unit) (256 ~ 1024, 32 bytes step size)	1024
UFS_PARAM_USE_SIF	311	Use SIF (0: not use SIF, 1: use SIF)	0
UFS_PARAM_DETECT_FAKE	312	Use live Finger Detection (0: not use LFD, 1 ~3 : use LFD); Higher value means more strong to fake finger * Supported Device: BioMini Slim(SFU-S20, SFU-S20B)	0

- *pValue [out]* : Receives parameter value of specified parameter type; pValue must point to adequate storage type matched to parameter type

Examples

```
int ufs_res;
long[] hScanner = new long[1];
int[] nValue = new int[1];

//make class library instance(BioMiniSDK p)

// Get hScanner handle

// Get timeout
ufs_res = p.UFS_GetParameter(hScanner[], p.UFS_PARAM_TIMEOUT, nValue );
// Error handling routine is omitted
// nValue[0] is the parameter value

// Get brightness
```

```
ufs_res = p.UFS_GetParameter(hScanner[], p.UFS_PARAM_BRIGHTNESS, nValue );
// Error handling routine is omitted

// Get sensitivity
ufs_res = p.UFS_GetParameter(hScanner[], p.UFS_PARAM_SENSITIVITY, nValue );
// Error handling routine is omitted

// Get detect core
ufs_res = p.UFS_GetParameter(hScanner[], p.UFS_PARAM_DETECT_CORE, nValue );
// Error handling routine is omitted

// Get template size
ufs_res = p.UFS_GetParameter(hScanner[], p.UFS_PARAM_TEMPLATE_SIZE, nValue
);
// Error handling routine is omitted

// Get use SIF
ufs_res = p.UFS_GetParameter(hScanner[], p.UFS_PARAM_USE_SIF, nValue );
// Error handling routine is omitted
```

Return Values(refer to return values)

UFS_SetParameter

Sets parameter value of UFScanner module.

```
int UFS_SetParameter(
      long hScanner,
      int nParam,
      int[] pValue );
```

Parameters

- *hScanner [in]* : Handle to the scanner object
- *nParam [in]* : Parameter type; one of parameters

Parameter	Code	Description	Default value
UFS_PARAM_TIMEOUT	201	Timeout (millisecond unit) (0: infinite)	5000
UFS_PARAM_BRIGHTNESS	202	Brightness (0 ~ 255); Higher value means darker image. * Not supported Device: BioMini-Slim(SFU-S20, SFU-S20B) BioMini(SFU-300)	100
UFS_PARAM_SENSITIVITY	203	Sensitivity (0 ~ 7); Higher value means more sensitive	4
UFS_PARAM_SERIAL	204	Serial (get only)	-
UFS_PARAM_SDK_VERSION	210	SDK Version (get only)	
UFS_PARAM_SDK_COPYRIGHT	211	SDK Copyright (get only)	
UFS_PARAM_DETECT_CORE	301	Detect core (0: not use core, 1: use core)	0
UFS_PARAM_TEMPLATE_SIZE	302	Template size (byte unit) (256 ~ 1024, 32 bytes step size)	1024
UFS_PARAM_USE_SIF	311	Use SIF (0: not use SIF, 1: use SIF)	0
UFS_PARAM_DETECT_FAKE	312	Use live Finger Detection (0: not use LFD, 1 ~3 : use LFD); Higher value means more strong to fake finger * Supported Device: BioMini Slim(SFU-S20, SFU-S20B)	0

- *pValue [in]* : Pointer to parameter value of specified parameter type; pValue must point to adequate storage type matched to parameter type

Examples

```
int ufs_res;
long[] hScanner = new long[1];
int[] nValue = new int[1];

//make class library instance(BioMiniSDK p)

// Get hScanner handle

// Set timeout to nValue nValue[0] = 5000;
ufs_res = p.UFS_SetParameter(hScanner[], p.UFS_PARAM_TIMEOUT, nValue);
// Error handling routine is omitted

// Set brightness to nValue nValue[0] = 100;
ufs_res = p.UFS_SetParameter(hScanner[], p.UFS_PARAM_BRIGHTNESS, nValue);
```

```
// Error handling routine is omitted

// Set sensitivity to nValue
ufs_res = p.UFS_SetParameter(hScanner[], p.UFS_PARAM_SENSITIVITY, nValue);
// Error handling routine is omitted

// Set detect core to nValue
ufs_res = p.UFS_SetParameter(hScanner[], p.UFS_PARAM_DETECT_CORE, nValue);
// Error handling routine is omitted

// Set template size to nValue
ufs_res = p.UFS_SetParameter(hScanner[], p.UFS_PARAM_TEMPLATE_SIZE, nValue);
// Error handling routine is omitted

// Set use SIF to nValue
ufs_res = p.UFS_SetParameter(hScanner[], p.UFS_PARAM_USE_SIF, nValue);
// Error handling routine is omitted
```

Return Values(refer to return values)

UFS_IsSensorOn

Checks whether a scanner is connected or not.

```
int UFS_IsSensorOn(
      long hScanner,
      int[] pbSensorOn );
```

Parameters

- *hScanner [in]* : Handle to the scanner object
- *pbSensorOn [out]* : Receive the status of specified scanner object; 1: the scanner is connected, 0: the scanner is disconnected

Return Values(refer to return values)

UFS_IsFingerOn

Checks whether a finger is placed on a scanner or not.

```
int UFS_IsFingerOn(
      long hScanner,
      int[] pbFingerOn );
```

Parameters

- *hScanner [in]* : Handle to the scanner object
- *pbFingerOn [out]* : Checks if a finger is placed on the specified scanner; 1: a finger is on the scanner, 0: a finger is not on the scanner

Return Values(refer to return values)

UFS_CaptureSingleImage

Captures single image. Captured image is stored to the internal buffer.

```
int UFS_CaptureSingleImage(
      long hScanner);
```

Parameters

- *hScanner [in]* : Handle to the scanner object

Examples

```
int ufs_res;
long[] hScanner = new long[1];

// make class library instance(BioMiniSDK p)

// Get hScanner handle

ufs_res = p.UFS_CaptureSingleImage(hScanner[]);
if (ufs_res == p.UFS_OK)
{
   // UFS_CaptureSingleImage is succeeded
}
else
{
   // UFS_CaptureSingleImage is failed
   // Use UFS_GetErrorString function to show error string
}
```

Return Values(refer to return values)

UFS_StartCapturing

Starts capturing. The capture is going on until the specified time exceeds.

```
int UFS_StartCapturing(
      long hScanner,
      String nCallbackFunctionName );
```

Parameters

- *hScanner [in]* : Handle to the scanner object
- *nCallbackFunctionName [in]* :

Examples

```
// Define capture procedure

public void captureCallback(int bFingerOn, byte[] pImage, int nWidth, int
nHeight, int nResolution)
{
   // ....
   // pMainInstance.drawCurrentFingerImage();
}

int ufs_res;
long[] hScanner = new long[1];

// make class library instance(BioMiniSDK p)

// Get hScanner handle

// Set parameter, the name of your call function for getting captured image

ufs_res = p.UFS_StartCapturing(hScanner[], "captureCallback");

if (ufs_res == p.UFS_OK)
{
   // UFS_StartCapturing is succeeded
}
else
{
   // UFS_StartCapturing is failed
   // Use UFS_GetErrorString function to show error string
}
```

Return Values(refer to return values)

UFS_StartAutoCapture

Starts the automatic capture. Currently this function is working for Suprema SFR600(BioMini Slim) only.

```
int UFS_StartAutoCapture(
      long hScanner,
      String nCallbackFunctionName );
```

Parameters

- *hScanner [in]* : Handle to the scanner object
- *nCallbackFunctionName [in]* :

Examples

```
// Define capture procedure

public void captureCallback(int bFingerOn, byte[] pImage, int nWidth, int
nHeight, int nResolution)
{
   // ....
   // pMainInstance.drawCurrentFingerImage();
}

int ufs_res;
long[] hScanner = new long[1];

// make class library instance(BioMiniSDK p)

// Get hScanner handle

// Set parameter, the name of your call function for getting captured image

ufs_res = p.UFS_StartAutoCapture(hScanner[], "captureCallback");
if (ufs_res == p.UFS_OK)
{
   // UFS_StartAutoCapture is succeeded
}
else
{
   // UFS_StartAutoCapture is failed
   // Use UFS_GetErrorString function to show error string
}
```

Return Values(refer to return values)

UFS_IsCapturing

Checks if the specified scanner is running to capture which is started by UFS_CaptureSingleImage or UFS_StartCapturing

```
int UFS_IsCapturing(
      long hScanner,
      int[] bCapturing );
```

Parameters

- *hScanner [in]* : Handle to the scanner object
- *bCapturing [out]* : Checks if the specified scanner is running capturing; 1: the capture is running, 0: the capture is not running

Return Values(refer to return values)

UFS_AbortCapturing

Aborts capturing which is started by UFS_CaptureSingleImage or UFS_StartCapturing.

```
int UFS_AbortCapturing(
      long hScanner);
```

Parameters

- *hScanner [in]* : Handle to the scanner object

Examples

```
int ufs_res;
long[] hScanner = new long[1];

// make class library instance(BioMiniSDK p)

// Get hScanner handle

ufs_res = p.UFS_AbortCapturing(hScanner[]);
if (ufs_res == p.UFS_OK)
{
   // UFS_AbortCapturing is succeeded
}
else
{
   // UFS_AbortCapturing is failed
   // Use UFS_GetErrorString function to show error string
}
```

Return Values(refer to return values)

UFS_Extract

Extracts a template from the stored image buffer which is acquired using UFS_CaptureSingleImage or UFS_StartCapturing.

```
int UFS_Extract(
      long hScanner,
      byte[] pTemplate,
      int[] pnTemplateSize,
      int[] pnEnrollQuality );
```

Parameters

- *hScanner [in]* : Handle to the scanner object
- *pTemplate [out]* : Pointer to the template array; The array must be allocated in advance
- *pnTemplateSize [out]* : Receives the size (in bytes) of pTemplate
- *pnEnrollQuality [out]* : Receives the quality of enrollment; Quality value ranges from 1 to 100. Typically this value should be above 30 for further processing such as enroll and matching. Especially in case of enrollment, the use of good quality image (above 50) is highly recommended.

Return Values(refer to return values)

UFS_ExtractEx

Extracts a template from the stored image buffer which is acquired using UFS_CaptureSingleImage or UFS_StartCapturing. This is extended version of UFS_Extract function to accommodate large size template.

```
int UFS_ExtractEx(
      long hScanner,
      int nBufferSize,
      byte[] pTemplate,
      int[] pnTemplateSize,
      int[] pnEnrollQuality );
```

Parameters

- *hScanner [in]* : Handle to the scanner object
- *nBufferSize [in]* : Template buffer size
- *pTemplate [out]* : Pointer to the template array; The array must be allocated in advance
- *pnTemplateSize [out]* : Receives the size (in bytes) of pTemplate
- *pnEnrollQuality [out]* : Receives the quality of enrollment; Quality value ranges from 1 to 100. Typically this value should be above 30 for further processing such as enroll and matching. Especially in case of enrollment, the use of good quality image (above 50) is highly recommended.

Examples

```
// Template size can be controlled by using UFS_SetParameter function
// Default value is 1024 bytes
int MAX_TEMPLATE_SIZE = 1024;

int ufs_res;
long[] hScanner = new long[1];
byte[] Template = new byte[MAX_TEMPLATE_SIZE];
int[] TemplateSize= new int[1];
int[] TemplateQuality= new int[1];

// make class library instance(BioMiniSDK p)

// Get hScanner handle

ufs_res = p.UFS_ExtractEx(hScanner[], MAX_TEMPLATE_SIZE, Template,
TemplateSize, TemplateQuality);
if (ufs_res == p.UFS_OK)
{
   // UFS_ExtractEx is succeeded
}
else
{
```

```
    // UFS_ExtractEx is failed
    // Use UFS_GetErrorString function to show error string
}
```

Return Values(refer to return values)

UFS_SetEncryptionKey

Sets encryption key.

```
int UFS_SetEncryptionKey(
      long hScanner,
      byte[] pKey );
```

Parameters

- *hScanner [in]* : Handle to the scanner object
- *pKey[out]* : Pointer to the 32 bytes key array; default key is first byte is 1 and second to 32th byte are all 0

Return Values(refer to return values)

UFS_EncryptTemplate

Encrypts template.

```
int UFS_EncryptTemplate(
       long hScanner,
       byte[] pTemplateInput,
       int nTemplateInputSize,
       byte[] pTemplateOutput,
       int[] pnTemplateOutputSize );
```

Parameters

- *hScanner [in]* : Handle to the scanner object
- *pTemplateInput [in]* : Pointer to input template data
- *nTemplateInputSize [in]* : Input template size
- *pTemplateOutput [out]* : Pointer to encrypted template data
- *pnTemplateOutputSize [in / out]* : Inputs allocated size of encrypted template data; Receives output template size

Return Values(refer to return values)

UFS_DecryptTemplate

Decrypts template.

```
int UFS_DecryptTemplate(
      long hScanner,
      byte[] pTemplateInput,
      int nTemplateInputSize,
      byte[] pTemplateOutput,
      int[] pnTemplateOutputSize );
```

Parameters

- *hScanner [in]* : Handle to the scanner object
- *pTemplateInput [in]* : Pointer to input template data(encrypted)
- *nTemplateInputSize [in]* : Input template size
- *pTemplateOutput [out]* : Pointer to output template data
- *pnTemplateOutputSize [in / out]* : Inputs allocated size of output template data; Receives output template size

Return Values(refer to return values)

UFS_GetCaptureImageBufferInfo

Gets the information of the capture image buffer.

```
int UFS_GetCaptureImageBufferInfo(
      long hScanner,
      int[] pnWidth,
      int[] pnHeight,
      int[] pnResolution );
```

Parameters

- *hScanner [in]* : Handle to the scanner object
- *pnWidth [out]* : Receives the width of the capture image buffer
- *pnHeight [out]* : Receives the height of the capture image buffer
- *pnResolution [out]* : Receives the resolution of the capture image buffer

Examples

```
int ufs_res;
long[] hScanner = new long[1];
int[] nWidth = new int[1];
int[] nHeight = new int[1];
int[] nResolution = new int[1];

// make class library instance(BioMiniSDK p)

// Get hScanner handle

ufs_res = p.UFS_GetCaptureImageBufferInfo(hScanner[], nWidth, nHeight,
nResolution);
if (ufs_res == p.UFS_OK)
{
   // UFS_GetCaptureImageBufferInfo is succeeded
}
else
{
   // UFS_GetCaptureImageBufferInfo is failed
   // Use UFS_GetErrorString function to show error string
}
```

Return Values(refer to return values)

UFS_GetCaptureImageBuffer

Copies the capture image buffer to the specified image data array.

```
int UFS_GetCaptureImageBuffer(
      long hScanner,
      byte[] pImageData );
```

Parameters

- *hScanner [in]* : Handle to the scanner object
- *pImageData [out]* : Pointer to image data array; The array must be allocated bigger than the size of capture image buffer in advance

Examples

```
int ufs_res;
long[] hScanner = new long[1];
int[]nWidth = new int[1];
int[]nHeight= new int[1];
int[]nResolution= new int[1];

// Get hScanner handle

// Get capture image buffer information
ufs_res = p.UFS_GetCaptureImageBufferInfo(hScanner[], nWidth, nHeight,
nResolution);
// Error handling routine is omitted

// Allocate image buffer
byte[] pImageData = new byte[nWidth * nHeight];

ufs_res = p.UFS_GetCaptureImageBuffer(hScanner[], pImageData);
if (ufs_res == p.UFS_OK)
{
   // UFS_GetCaptureImageBuffer is succeeded
}
else
{
   // UFS_GetCaptureImageBuffer is failed
   // Use UFS_GetErrorString function to show error string
}
```

Return Values(refer to return values)

UFS_GetCaptureImageBufferToBMPImageBuffer

Copies the capture image buffer to the specified image data of bmp format.

```
int UFS_GetCaptureImageBufferToBMPImageBuffer(
      long hScanner,
      byte[] pImageData,
      int[] pImageLength );
```

Parameters

- *hScanner [in]* : Handle to the scanner object
- *pImageData [out]* : Pointer to bmp image data; The buffer must be allocated bigger than the size of capture image buffer in advance
- *pImageLength [out]* : pointer to bmp image data size

Return Values(refer to return values)

UFS_GetCaptureImageBufferTo19794_4ImageBuffer

Copies the capture image buffer to the specified image data of 19794_4 format.

```
int UFS_GetCaptureImageBufferTo19794_4ImageBuffer(
      long hScanner,
      byte[] pImageData,
      int[] pImageLength );
```

Parameters

- *hScanner [in]* : Handle to the scanner object
- *pImageData [out]* : Pointer to 19794_4 format image data; The buffer must be allocated bigger than the size of capture image buffer in advance
- *pImageLength [out]* : pointer to 19794_4 format image data size

Return Values(refer to return values)

UFS_GetCaptureImageBufferToWSQImageBuffer

Copies the capture image buffer to the specified image data of the WSQ format.

```
int UFS_GetCaptureImageBufferToWSQImageBuffer(
      long hScanner,
      float ratio,
      byte[] wsqData,
      int[] wsqDataLen );
```

Parameters

- *hScanner [in]* : Handle to the scanner object
- *ratio [in]* : Compression ratioof image
- *wsqData [out]* : Pointer to WSQ format image data; The buffer must be allocated bigger than the size of capture image buffer in advance
- *wsqDataLen [out]* : pointer to WSQ format image data size

Return Values(refer to return values)

UFS_GetCaptureImageBufferToWSQImageBufferVar

Copies the capture image buffer (cropped or expanded to the specified size) to the target image data buffer of the WSQ format.

```
int UFS_GetCaptureImageBufferToWSQImageBufferVar(
      long hScanner,
      float ratio,
      byte[] wsqData,
      int[] wsqDataLen,
      int nWidth,
      int nHeight );
```

Parameters

- *hScanner [in]* : Handle to the scanner object
- *ratio [in]* : Compression ratio of image
- *wsqData [out]* : Pointer to WSQ format image data; The buffer must be allocated bigger than the size of capture image buffer in advance
- *wsqDataLen [out]* : pointer to WSQ format image data size
- *nWidth [in]* : Width to resize the capture image
- *nHeight [in]* : Height to resize the capture image

Return Values(refer to return values)

UFS_DecompressWSQBMP

Decompress WSQ file and save to BMP file.

```
int UFS_ DecompressWSQBMP(
      long hScanner,
      String wsqFile,
      String bmpFile );
```

Parameters

- *hScanner [in]* : Handle to the scanner object
- *wsqFile [in]* : Specifies file name to get wsq data buffer
- *bmpFile [in]* : Specifies file name to save image buffer

Return Values(refer to return values)

UFS_DecompressWSQBMPMem

Decompress WSQ buffer and save to image data of bmp format.

```
int UFS_ DecompressWSQBMPMem(
      long hScanner,
      byte[] wsqBuffer,
      int wsqBufferLen,
      byte[] bmpBuffer,
      int[] bmpBufferLen );
```

Parameters

- *hScanner [in]* : Handle to the scanner object
- *wsqBuffer [in]* : Pointer to WSQ format image data
- *wsqBufferLen [in]* : Size of WSQ format image data
- *bmpBuffer [out]* : Pointer to bmp image data; The array must be allocated bigger than the size of capture image buffer in advance.
- *bmpBufferLen [out]* : pointer to bmp image data size

Return Values(refer to return values)

UFS_SaveCaptureImageBufferToBMP

Saves the capture image buffer to the specified file of the bitmap format.

```
int UFS_SaveCaptureImageBufferToBMP(
      long hScanner,
      String szFileName );
```

Parameters

- *hScanner [in]* : Handle to the scanner object
- *szFileName [in]* : Specfies file name to save image buffer

Examples

```
int ufs_res;
long[] hScanner = new long[1];
String szFileName;

// make class library instance(BioMiniSDK p)

// Get hScanner handle

// Get file name, szFileName

ufs_res = p.UFS_SaveCaptureImageBufferToBMP(hScanner[], szFileName);
if (ufs_res == p.UFS_OK)
{
   // UFS_SaveCaptureImageBufferToBMP is succeeded
}
else
{
   // UFS_SaveCaptureImageBufferToBMP is failed
   // Use UFS_GetErrorString function to show error string
}
```

Return Values(refer to return values)

UFS_SaveCaptureImageBufferTo19794_4

Saves the capture image buffer to the specified file of the 19794_4 format.

```
java int UFS_SaveCaptureImageBufferTo19794_4(
      long hScanner,
      String szFileName );
```

Parameters

- *hScanner [in]* : Handle to the scanner object
- *szFileName [in]* : Specifies file name to save image buffer

Examples

```
int ufs_res;
long[] hScanner = new long[1];
String szFileName;

// make class library instance(BioMiniSDK p)

// Get hScanner handle

 // Get file name, szFileName

ufs_res = p.UFS_SaveCaptureImageBufferTo19794_4(hScanner[], szFileName);
if (ufs_res == p.UFS_OK)
{
   // UFS_SaveCaptureImageBufferTo19794_4 is succeeded
}
else
{
   // UFS_SaveCaptureImageBufferTo19794_4 is failed
   // Use UFS_GetErrorString function to show error string
}
```

Return Values(refer to return values)

UFS_SaveCaptureImageBufferToWSQ

Saves the capture image buffer to the specified file of the WSQ format.

```
int UFS_SaveCaptureImageBufferToWSQ(
      long hScanner,
      float ratio,
      String szFileName );
```

Parameters

- *hScanner [in]* : Handle to the scanner object
- *ratio [in]* : Compression ratio of image
- *szFileName [in]* : Specifies file name to save image buffer

Return Values(refer to return values)

UFS_SaveCaptureImageBufferToWSQVar

Saves the capture image buffer (cropped or expanded to the specified size) to the target file of the WSQ format.

```
int UFS_SaveCaptureImageBufferToWSQVar(
      long hScanner,
      float ratio,
      String szFileName,
      int nWidth,
      int nHeight );
```

Parameters

- *hScanner [in]* : Handle to the scanner object
- *ratio [in]* : Compression ratio of image
- *szFileName [in]* : Specfies file name to save image buffer
- *nWidth [in]* : Width to resize the capture image
- *nHeight [in]* : Height to resize the capture image

Return Values(refer to return values)

UFS_ClearCaptureImageBuffer

Clears the capture image buffer stored to the internal buffer.

```
int UFS_ClearCaptureImageBuffer(
      long hScanner);
```

Parameters

- *hScanner [in]* : Handle to the scanner object

Examples

```
int ufs_res;
long[] hScanner = new long[1];

// make class library instance(BioMiniSDK p)

// Get hScanner handle

ufs_res = p.UFS_ClearCaptureImageBuffer(hScanner[]);
if (ufs_res == p.UFS_OK)
{
   // UFS_ClearCaptureImageBuffer is succeeded
}
else
{
   // UFS_ClearCaptureImageBuffer is failed
   // Use UFS_GetErrorString function to show error string
}
```

Return Values(refer to return values)

UFS_GetErrorString

Gets the error string for specified UFS_STAUS value.

```
int UFS_GetErrorString(
      int res,
      byte[] szErrorString );
```

Parameters

- *hScanner [in]* : Handle to the scanner object
- *szErrorString [out]* : Receives error string

Examples

```
int ufs_res;
byte[] strError = new byte[128];

// Get status return code, ufs_res

ufs_res = p.UFS_GetErrorString(ufs_res, strError);
if (ufs_res == p.UFS_OK)
{
   // UFS_GetErrorString is succeeded
}
else
{
   // UFS_GetErrorString is failed
}
```

Return Values(refer to return values)

UFS_GetTemplateType

Gets the template type value.

```
int UFS_GetTemplateType(
      long hScanner,
      int[] nTemplateType );
```

Parameters

- *hScanner [in]* : Handle to the scanner object
- *nTemplateType [out]* : Receives the parameter value of specified parameter type; 'pValue' must point to adequate type that is matched with the parameter type

Template type	Code	Description
UFS_TEMPLATE_TYPE_SUPREMA	2001	Suprema template type
UFS_TEMPLATE_TYPE_ISO19794_2	2002	ISO template type
UFS_TEMPLATE_TYPE_ANSI378	2003	ANSI378 template type

Return Values(refer to return values)

UFS_SetTemplateType

Sets the template type value.

```
int UFS_SetTemplateType(
      long hScanner,
      int nTemplateType );
```

Parameters

- *hScanner [in]* : Handle to the scanner object
- *nTemplateType [in]* : Parameter type; one of template type

Template type	Code	Description
UFS_TEMPLATE_TYPE_SUPREMA	2001	Suprema template type
UFS_TEMPLATE_TYPE_ISO19794_2	2002	ISO template type
UFS_TEMPLATE_TYPE_ANSI378	2003	ANSI378 template type

Examples

```
int ufs_res;
long[] hScanner = new long[1];
int nTemplateType;

// make class library instance(BioMiniSDK p)

// Get hScanner handle

nTemplateType =UFS_TEMPLATE_TYPE_SUPREMA;

ufs_res = p.UFS_SetTemplateType(hScanner[], nTemplateType);
// Error handling routine is omitted
```

Return Values(refer to return values)

UFS_SelectTemplate

Selects n number of good templates from m number of input templates.

```
int UFS_SelectTemplate(
      long hScanner,
      byte[][] ppTemplateInput,
      int[] pnTemplateInputSize,
      int nTemplateInputNum,
      byte[][] ppTemplateOutput,
      int[] pnTemplateOutputSize,
      int nTemplateOutputNum );
```

Parameters

- *hScanner [in]* : Handle to the scanner object
- *ppTemplateInput [in]* : Array pointer to the input template arrays
- *pnTemplateInputSize [in]* : Array pointer to input templates'size
- *nTemplateInputNum [in]* : Number of input templates
- *ppTemplateOutput [out]* : Array pointer to the output template arrays
- *pnTemplateOutputSize [out]* : Array pointer to the output templates'size
- *nTemplateOutputNum [in]* : Number of output templates; should be less than input template number by more than one

Return Values(refer to return values)

UFS_SelectTemplateEx

Selects n number of good templates from m number of input templates. This is extended version of UFS_SelectTemplate function to accommodate large size template.

```
nt UFS_SelectTemplateEx(
      long hScanner,
      int nBufferSize,
      byte[][] ppTemplateInput,
      int[] pnTemplateInputSize,
      int nTemplateInputNum,
      byte[][] ppTemplateOutput,
      int[] pnTemplateOutputSize,
      int nTemplateOutputNum );
```

Parameters

- *hScanner [in]* : Handle to the scanner object
- *nBufferSize [in]* : Template buffer size
- *ppTemplateInput [in]* : Array pointer to the input template arrays
- *pnTemplateInputSize [in]* : Array pointer to the input templates'size
- *nTemplateInputNum [in]* : Number of input templates
- *ppTemplateOutput [out]* : Array pointer to the output template arrays
- *pnTemplateOutputSize [out]* : Array pointer to the output templates'size
- *nTemplateOutputNum [in]* : Number of output templates; should be less than input template number by more than one

Return Values(refer to return values)

UFS_GetFPQuality

Calculates the quality score of an image as defined in NISTIR 7151: FingerPrint Image Quality. The score would be between 1(excellent) and 5(poor).

```
int UFS_GetFPQuality(
       long hScanner,
       byte[] pFPImage,
       int nWidth,
       int nHeight,
       int[] pnFPQuality );
```

Parameters

- *hScanner [in]* : Handle to the scanner object
- *pFPImage [in]* : Raw capture image data
- *nWidth [in]* : Width of capture image data
- *nHeight [in]* : Height of capture image data
- *pnFPQuality [in]* : NIST quality score of image data

Return Values(refer to return values)

UFS_GetFeatureNumber

Get the number of Minutiae from the template data.

```
int UFS_GetFeatureNumber(
      long hScanner,
      byte[] pTemplate,
      int nTemplateSize,
      int[] pnFeatureNum );
```

Parameters

- *hScanner [in]* : Handle to the scanner object
- *pTemplate [in]* : Template data
- *nTemplateSize [in]* : Size of template data
- *pnFeatureNum [out]* : The number of minutiae from pTemplate

Return Values(refer to return values)

UFM_Create

Creates a matcher object.

```
int UFM_Create(
      long hMatcher);
```

Parameters

- *hMatcher [out]* : Pointer to handle of the matcher object

Examples

```
int ufm_res;
long[] hMatcher = new long[1];

//make instance
p = new BioMiniSDK();

ufm_res = p.UFM_Create(hMatcher);
if (ufm_res == p.UFM_OK)
{
   // UFM_Create is succeeded
   // hMatcher[0] is the handle
}
else
{
   // UFM_Create is failed
   // Use UFM_GetErrorString function to show error string
}
```

Return Values(refer to return values)

UFM_Delete

Deletes specified matcher object.

```
int UFM_Delete(
      long hMatcher);
```

Parameters

- *hMatcher [in]* : Handle to the matcher object

Examples

```
int ufm_res;
long[] hMatcher = new long[1];

// make class library instance(BioMiniSDK p)

// Create hMatcher handle
ufm_res = p.UFM_Delete(hMatcher[]);
if (ufm_res == p.UFM_OK)
{
   // UFM_Delete is succeeded
}
else
{
   // UFM_Delete is failed
   // Use UFM_GetErrorString function to show error string
}
```

Return Values(refer to return values)

UFM_GetParameter

Gets parameter value of UFMatcher module.

```
int UFM_GetParameter(
      long hMatcher,
      int nParam,
      int[] pValue );
```

Parameters

- *hMatcher [in]* : Handle to the matcher object
- *nParam [in]* : Parameter type; one of parameters

Parameter	Code	Description	Default value
UFM_PARAM_FAST_MODE	301	Fast Mode (0: not use fast mode, 1: use fast mode)	1
UFM_PARAM_SECURITY_LEVEL	302	Set the False Accept Ratio(FAR) (1: Below 1%, 2: Below 0.1%, 3: Below 0.01%, 4: Below 0.001%, 5: Below 0.0001%, 6: Below 0.00001%, 7: Below 0.000001%)	4
UFM_PARAM_USE_SIF	311	Use SIF (0: not use SIF, 1: use SIF)	0
UFM_PARAM_AUTO_ROTATE	321	Rotate Mode(0: not use rotate mode, 1: use rotate mode)	0
UFM_PARAM_SDK_VERSION	210	SDK Version (get only)	-
UFM_PARAM_SDK_COPYRIGHT	211	SDK Copyright (get only)	

- *pValue [out]* : Receives parameter value of specified parameter type; pValue must point to adequate storage type matched to parameter type

Examples

```
int ufm_res;
long[] hMatcher = new long[1];
int[] nValue = new int[1];

// make class library instance(BioMiniSDK p)

// Create hMatcher handle

// Get fast mode
ufm_res = p.UFM_GetParameter(hMatcher[], p.UFM_PARAM_FAST_MODE, nValue);
// Error handling routine is omitted

// Get security level
ufm_res = p.UFM_GetParameter(hMatcher[], p.UFM_PARAM_SECURITY_LEVEL,
nValue);
// Error handling routine is omitted

// Get use SIF
ufm_res = p.UFM_GetParameter(hMatcher[], p.UFM_PARAM_USE_SIF, &nValue);
// Error handling routine is omitted
```

Return Values(refer to return values)

UFM_SetParameter

Sets parameter value of UFMatcher module.

```
int UFM_SetParameter(
      long hMatcher,
      int nParam,
      int[] pValue );
```

Parameters

- *hMatcher [in]* : Handle to the matcher object
- *nParam [in]* : Parameter type; one of parameters

Parameter	Code	Description	Default value
UFM_PARAM_FAST_MODE	301	Fast Mode (0: not use fast mode, 1: use fast mode)	1
UFM_PARAM_SECURITY_LEVEL	302	Set the False Accept Ratio(FAR) (1: Below 1%, 2: Below 0.1%, 3: Below 0.01%, 4: Below 0.001%, 5: Below 0.0001%, 6: Below 0.00001%, 7: Below 0.000001%)	4
UFM_PARAM_USE_SIF	311	Use SIF (0: not use SIF, 1: use SIF)	0
UFM_PARAM_AUTO_ROTATE	321	Rotate Mode(0: not use rotate mode, 1: use rotate mode)	0
UFM_PARAM_SDK_VERSION	210	SDK Version (get only)	-
UFM_PARAM_SDK_COPYRIGHT	211	SDK Copyright (get only)	

- *pValue [in]* : Pointer to parameter value of specified parameter type; pValue must point to adequate storage type matched to parameter type

Examples

```
int_STATUS ufm_res;
long[] hMatcher = new long[1];
int[] nValue = new int[1];

// make class library instance(BioMiniSDK p)

// Create hMatcher handle

// Set fast mode to nValue
nValue[] = 1;
ufm_res = p.UFM_SetParameter(hMatcher[], p.UFM_PARAM_FAST_MODE, nValue);
// Error handling routine is omitted

// Set security level to nValue
nValue[] = 4;
ufm_res = UFM_SetParameter(hMatcher[], p.UFM_PARAM_SECURITY_LEVEL, nValue);
// Error handling routine is omitted

// Set use SIF to nValue
nValue[] = ;
```

```
ufm_res = UFM_SetParameter(hMatcher[], p.UFM_PARAM_USE_SIF, nValue);
// Error handling routine is omitted
```

Return Values(refer to return values)

UFM_Verify

Compares two extracted templates.

```
int UFM_Verify(
      long hMatcher,
      byte[] pTemplate1,
      int nTemplate1Size,
      byte[] pTemplate2,
      int nTemplate2Size,
      int[] bVerifySucceed );
```

Parameters

- *hMatcher [in]* : Handle to the matcher object
- *pTemplate1 [in]* : Pointer to the template1
- *nTemplate1Size [in]* : Specifies the size of the template1
- *pTemplate2 [in]* : Pointer to the template2
- *nTemplate2Size [in]* : Specifies the size of the template2
- *bVerifySucceed [out]* : Receives, whether verification is succeed; 1: verification is succeed, 0: verification is failed

Examples

```
// Assume template size is 1024 bytes
int MAX_TEMPLATE_SIZE = 1024;

int ufm_res;
Pointer hMatcher;
byte[] Template1 = new byte[MAX_TEMPLATE_SIZE];
byte[] Template2 = new byte[MAX_TEMPLATE_SIZE];
int nTemplate1Size;
int nTemplate2Size;
int[] bVerifySucceed = new int[1];
int nSucceed;

// make class library instance(BioMiniSDK p)

// Create hMatcher handle

// Get two templates, Template1 and Template2

ufm_res = p.UFM_Verify(hMatcher[], Template1, nTemplate1Size, Template2,
nTemplate2Size, bVerifySucceed);
if (ufm_res == p.UFM_OK)
{
   // UFM_Verify is succeeded
   nSucceed=bVerifySucceed[];
```

```
    if (nSucceed)
    {
        // Template1 is matched to Template2
    }
    else
    {
        // Template1 is not matched to Template2
    }
}
else
{
    // UFM_Verify is failed
    // Use UFM_GetErrorString function to show error string
}
```

Return Values(refer to return values)

UFM_Identify, UFM_IdentifyMT

Compares a template with given template array. UFM_IdentifyMT function uses multi threads internally for faster identifying in multi-core systems.

```
int UFM_Identify(
      long hMatcher,
      byte[] pTemplate1,
      int nTemplate1Size,
      byte[][] pTemplate2,
      int[] nTemplate2Size,
      int nTemplate2Num,
      int nTimeout,
      int[] nMatchTemplate2Index );

int UFM_IdentifyMT(
      long hMatcher,
      byte[] pTemplate1,
      int nTemplate1Size,
      byte[][] pTemplate2,
      int[] nTemplate2Size,
      int nTemplate2Num,
      int nTimeout,
      int[] nMatchTemplate2Index );
```

Parameters

- *hMatcher [in]* : Handle of the matcher object
- *pTemplate1 [in]* : Pointer to the template
- *nTemplate1Size [in]* : Specifies the size of the template
- *ppTemplate2 [in]* : Pointer to the template array
- *pnTemplate2Size [in]* : Pointer to the template size array
- *nTemplate2Num [in]* : Specifies the number of templates in the template array
- *nTimeout [in]* : Specifies maximum time for identifying in milliseconds; If elapsed time for identifying exceeds nTimeout, function stops further identifying and returns UFM_ERR_MATCH_TIMEOUT; 0 means infinity
- *pnMatchTemplate2Index [out]* : Receives the index of matched template in the template array; -1 means pTemplate1 is not matched to all of templates in ppTemplate2

Return Values(refer to return values)

UFM_AbortIdentify

Aborts current identifying procedure started using UFM_Identify.

```
int UFM_AbortIdentify(
      long hMatcher);
```

Parameters

- *hMatcher [in]* : Handle to the matcher object

Examples

```
int ufm_res;
long[] hMatcher = new long[1];

// make class library instance(BioMiniSDK p)

// Create hMatcher handle

// Start UFM_Identify

ufm_res = p.UFM_AbortIdentify(hMatcher);
if (ufm_res == p.UFM_OK)
{
   // UFM_AbortIdentify is succeeded
}
else
{
   // UFM_AbortIdentify is failed
   // Use UFM_GetErrorString function to show error string
}
```

Return Values(refer to return values)

UFM_IdentifyInit

Initializes identify with input template.

```
int UFM_IdentifyInit(
      long hMatcher,
      byte[] pTemplate1,
      int nTemplate1Size );
```

Parameters

- *hMatcher [in]* : Handle to the matcher object
- *pTemplate1 [in]* : Pointer to the template
- *nTemplate1Size [in]* : Specifies the size of the template

Examples

```
// Assume template size is 1024 bytes
int MAX_TEMPLATE_SIZE = 1024;

int ufm_res;
long[] hMatcher = new long[1];
byte[] Template1 = new byte[MAX_TEMPLATE_SIZE];
int nTemplate1Size;

// make class library instance(BioMiniSDK p)

 // Create hMatcher handle

// Get Template1

ufm_res = p.UFM_IdentifyInit(hMatcher[], Template1, nTemplate1Size);
if (ufm_res == p.UFM_OK)
{
   // UFM_IdentifyInit is succeeded
}
else
{
   // UFM_IdentifyInit is failed
   // Use UFM_GetErrorString function to show error string
}
```

Return Values(refer to return values)

UFM_IdentifyNext

Matches one input template to the template specified in UFM_IdentifyInit.

```
int UFM_IdentifyNext(
      long hMatcher,
      byte[] pTemplate2,
      int nTemplate2Size,
      int[] bIdentifySucceed );
```

Parameters

- *hMatcher [in]* : Handle to the matcher object
- *pTemplate2 [in]* : Pointer to the template array
- *nTemplate2Size [in]* : Specifies the size of the template array
- *bIdentifySucceed [out]* : Receives whether identification is succeed; 1: identification is succeed, 0: identification is failed

Examples

```
int MAX_TEMPLATE_NUM = 50;

int ufm_res;
long[] hMatcher = new long[1];
byte[] Template2 = new byte[MAX_TEMPLATE_NUM];
int[] nTemplate2Size = new byte[MAX_TEMPLATE_NUM];
int nTemplate2Num;
int[] bIdentifySucceed = new int[1];
int i;

// make class library instance(BioMiniSDK p)

// Create hMatcher handle

// Get number of templates in DB or something, and save it to nTemplate2Num

for (i = ; i < nTemplate2Num; i++)
{
   // Get one template in DB or something, and save it to Template2 and
nTemplate2Size

   ufm_res = p.UFM_IdentifyNext(hMatcher[], Template2[i], nTemplate2Size[i],
bIdentifySucceed[]);
   if (ufm_res == p.UFM_OK)
   {
      // UFM_IdentifyNext is succeeded
   }
   else
```

```
    {
        // UFM_IdentifyNext is failed
        // Use UFM_GetErrorString function to show error string
        // return;
    }

    if (bIdentifySucceed[])
    {
        // Identification is succeed
        break;
    }
}
if (!bIdentifySucceed[])
{
    // Identification is failed
}
```

Return Values(refer to return values)

UFM_RotateTemplate

Rotates the specified template to the amount of 180 degrees.

```
int UFM_RotateTemplate(
      long hMatcher,
      byte[] pTemplate,
      int nTemplateSize );
```

Parameters

- *hMatcher [in]* : Handle to the matcher object
- *pTemplate [in / out]* : Pointer to the template
- *nTemplateSize [in]* : Specifies the size of the template

Examples

```
// Assume template size is 1024 bytes
int MAX_TEMPLATE_SIZE = 1024;

int ufm_res;
long[] hMatcher = new long[1];
byte[] Template = new byte[MAX_TEMPLATE_SIZE];
int nTemplateSize;

// make class library instance(BioMiniSDK p)

// Create hMatcher handle

// Get a template, and save it to Template and nTemplateSize

ufm_res = p.UFM_RotateTemplate(hMatcher[], Template, nTemplateSize);
if (ufm_res == p.UFM_OK)
{
   // UFM_RotateTemplate is succeeded
}
else
{
   // UFM_RotateTemplate is failed
   // Use UFM_GetErrorString function to show error string
}
```

Return Values(refer to return values)

UFM_GetErrorString

Gets the error string for specified UFM_STATUS value.

```
int UFM_GetErrorString(
      int res,
      byte[] szErrorString );
```

Parameters

- *res [in]* : Status return value
- *szErrorString [out]* : Receives error string

Examples

```
int ufs_res;
byte[] strError = new byte[128];

// Get status return code, ufm_res
ufs_res = p.UFM_GetErrorString(ufs_res, strError);
if (ufs_res == p.UFS_OK)
{
   // UFM_GetErrorString is succeeded
}
else
{
   // UFM_GetErrorString is failed
}
```

Return Values(refer to return values)

UFM_GetTemplateType

Gets the parameter value.

```
int UFM_GetTemplateType(
      long hMatcher,
      int[] nTemplateType );
```

Parameters

- *hMatcher [in]* : Handle to the matcher object
- *pValue [out]* : Receives parameter value of specified parameter type; pValue must point to adequate storage type matched to template type

Template type	Code	Description
UFM_TEMPLATE_TYPE_SUPREMA	2001	Suprema template type
UFM_TEMPLATE_TYPE_ISO19794_2	2002	ISO template type
UFM_TEMPLATE_TYPE_ANSI378	2003	ANSI378 template type

Examples

```
int ufm_res;
long[] hMatcher = new long[1];
int[] nTemplateType = new int[1];

// make class library instance(BioMiniSDK p)

// Create hMatcher handle

ufm_res = p.UFM_GetTemplateType(hMatcher[], nTemplateType );
// Error handling routine is omitted
```

Return Values(refer to return values)

UFM_SetTemplateType

Gets parameter value.

```
int UFM_SetTemplateType(
      long hMatcher,
      int nTemplateType );
```

Parameters

- *hMatcher [in]* : Handle to the matcher object
- *nTemplateType [in]* : Parameter type; one of template type

Template type	Code	Description
UFM_TEMPLATE_TYPE_SUPREMA	2001	Suprema template type
UFM_TEMPLATE_TYPE_ISO19794_2	2002	ISO template type
UFM_TEMPLATE_TYPE_ANSI378	2003	ANSI378 template type

Examples

```
int ufm_res;
long[] hMatcher = new long[1];
int nTemplateType;

// make class library instance(BioMiniSDK p)

// Create hMatcher handle
nTemplateType =p.UFM_TEMPLATE_TYPE_SUPREMA;

ufm_res = p.UFM_SetTemplateType(hMatcher[], nTemplateType);
// Error handling routine is omitted
```

Return Values(refer to return values)

UFS_STATUS

Every function in a UFScanner module returns UFS_OK when it succeeds. When it fails, it returns a value corresponding to a error code. Please find the error code on the followings if you'd like to know the information about the UFS_STATUS (integer) value.

Code	Value	Description
UFS_OK	0	Success
UFS_ERROR	-1	General error
UFS_ERR_NO_LICENSE	-101	Device is not connected or License is not located
UFS_ERR_LICENSE_NOT_MATCH	-102	License does not match
UFS_ERR_LICENSE_EXPIRED	-103	License has expired
UFS_ERR_NOT_SUPPORTED	-111	This function is not supported
UFS_ERR_INVALID_PARAMETERS	-112	Input parameters are invalid
UFS_ERR_ALREADY_INITIALIZED	-201	Module is already initialized
UFS_ERR_NOT_INITIALIZED	-202	Module is not initialized
UFS_ERR_DEVICE_NUMBER_EXCEED	-203	Device number exceeds
UFS_ERR_LOAD_SCANNER_LIBRARY	-204	Error on loading the library of a scanner
UFS_ERR_CAPTURE_RUNNING	-211	Capturing is started using UFS_CaptureSingleImage or UFS_StartCapturing
UFS_ERR_CAPTURE_FAILED	-212	Capturing is timeout or aborted
UFS_ERR_NOT_GOOD_IMAGE	-301	Input image is not good
UFS_ERR_EXTRACTION_FAILED	-302	Extraction is failed
UFS_ERR_CORE_NOT_DETECTED	-351	Core is not detected
UFS_ERR_CORE_TO_LEFT_TOP	-353	Move finger to left-top
UFS_ERR_CORE_TO_TOP	-354	Move finger to top
UFS_ERR_CORE_TO_RIGHT_TOP	-355	Move finger to right-top
UFS_ERR_CORE_TO_RIGHT	-356	Move finger to right
UFS_ERR_CORE_TO_RIGHT_BOTTOM	-357	Move finger to right-bottom
UFS_ERR_CORE_TO_BOTTOM	-358	Move finger to bottom
UFS_ERR_CORE_TO_LEFT_BOTTOM	-359	Move finger to left-bottom

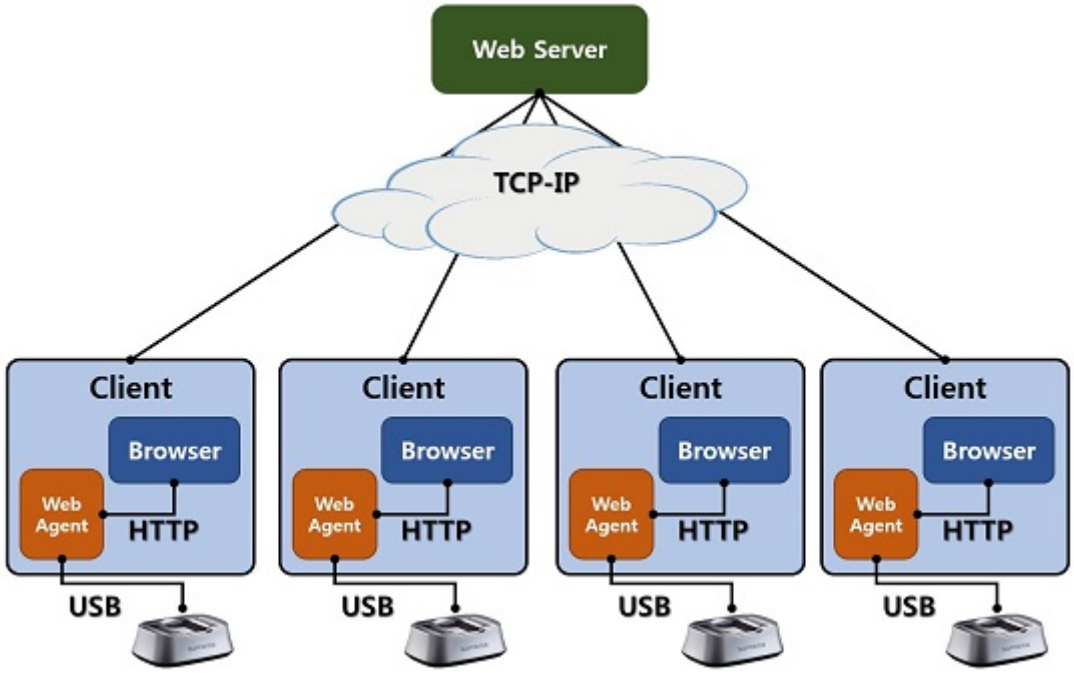
UFM_STATUS

Every function in a UFMatcher module returns UFM_OK when it succeeds. When it fails, it returns a value corresponding to a error code. Please find the error code on the followings if you'd like to know the information about the UFM_STATUS (integer) value.

Code	Value	Description
UFM_OK	0	Success
UFM_ERROR	-1	General error
UFM_ERR_NO_LICENSE	-101	System has no license
UFM_ERR_LICENSE_NOT_MATCH	-102	License does not match
UFM_ERR_LICENSE_EXPIRED	-103	License has expired
UFM_ERR_NOT_SUPPORTED	-111	This function is not supported
UFM_ERR_INVALID_PARAMETERS	-112	Input parameters are invalid
UFM_ERR_MATCH_TIMEOUT	-401	Matching is timeout
UFM_ERR_MATCH_ABORTED	-402	Matching is aborted
UFM_ERR_TEMPLATE_TYPE	-411	Template type does not match

6. WebAgent

Able to use as below package by installing Web-Agent to the client and multiple access is supported according to the network and RDP server performance, theoretically thre is no limitation. But only the minimum requirements must met to perform. (Minimum Atom 1.5GHz Dual core)



This page describes the basic functions of BioMini-WebAgent in a step-by-step manner. The Guide contains following topics,

- Introduction
- APIs

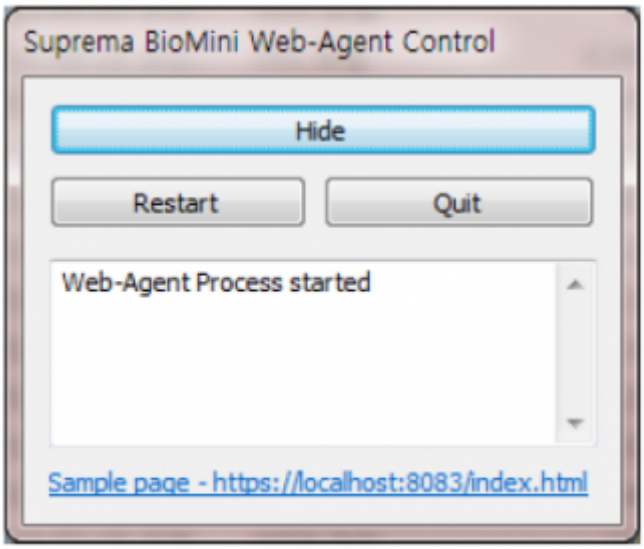
6.1 Introduction

Contents of Web-agent packages

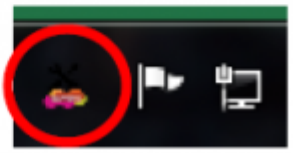
Directory	Sub Directory	Contents
/bin/	-	AgentCntrl.exe : Agent Control UI
		BioMini_WebAgent.exe : Web-Agent console UI
	html	index.html : Example page for Web-API connected with Web-Agent
		favicon.ico : Icon for localhost URL
		jquery.min.js : IJQuery script (replaceable)
		BioMiniWebAgent.js : Example code of Web-API script
	cert	localhost_set.crt : Certification file for locallost URL
		localhost_cert.key : Key of the same

Usage

Installing Weg-Agent



Agent Control UI



Tray Icon

By executing Setup_Suprema_BioMini_SDK.exe, Web-agent and Web-agent control UI will be installed in C:\Program Files\Suprema\BioMini\bin directory. User may register AgentCtrl.exe as a start-up program manually When you run 'AgentCtrl.exe', Control UI will be appeared, and you may hide it by clicking 'Hide' button.
You can find the minimized icon at the tray bar By double-clicking the tray icon, control UI will be shown again.
If VC 2013 Redistributable package isn't installed, you should install it during the installation of BioMini SDK by enabling check box.

Embedding in HTML

You may add JavaScript as guided in the example code located in bin/html folder of SDK. You may simply embed java script file of the example as the following code.

```
<head>
<script language='javascript' src='array.generics.min.js'></script>
<script language='javascript' src='jquery.min.js'></script>
<script language='javascript' src='BiominiWebAgent.js'></script>
</head>
```

There are several target ID as below

ID

Fpimg(img/Preview_Fingerprint image to be updated by SDK)
Tb_DisplayLog(text/Log message from JavaScript)
Tb_Sensitivity(button/Scanner optioin_Capture sensitivity)
Tb_BrightnessValue(text/Scanner option_Brightness)
DDb SecuLevOpt(text/Scanner option_Security level)
DDb TimeoutOpt(text/Scanner option_capture timeout)
DDb Tpltype(text/Extraction option_Template type)
DDb CompRatio(text/Extraction option _compression ratio)
DDb QltyLv(text/Matching option_Quality level)
DDb Tftype(text/Save option/Fingerprint image file type)

You may use following JavaScript functions or you may modify it for your own purpose

Function Name

Init (Initialize the device_api/initDevice)
UnInit (Reset device to be Initialized again _api/uninitDevice)
OnSelectScannerOptions(Updates message tagged with 'Tb_DisplayLog' ID._ api/getScannerStatus)
StartCapture (Start the capture process _ api/startCapturing)
AbortCapture (Abort on going capture process_/api/abortCapture)
GetTemplateData (Get template data of the fingerprint image which is most recently captured _ /api/getTemplateData)
SendParameter (/api/setParameters)
CaptureSingle (Capture fingerprint image without showing preview image – result will be shown directly after the detection of a finger _ /api/captureSingle)
AutoCapture(Capture fingerprint by the condition of finger-on_/api/autoCapture)
SaveImageBuffer(Save the current image buffer to a predefined location (convertedCaptureImage.*)._/api/saveImageBuffer)
UpdateTemplate(Update specific data given as a parameter_/api/update)
InfoDelAll(Delete all user data registered in the user database of the web-agent _ /api/deleteAll)
SaveTemplate(Save template file of selected user in the user database of the web-agent_/api/saveTemplate)
Identify(Identify the fingerprint from the user database of the web-agent _ /api/identify)

AbortIdentify(Abort identification process. _ /api/abortIdentify)
DelTpl(Delete a specific user at the user database of the web-agent _ /api/delete)

Using Web-API

Web-Agent works on localhost domain address as a web-page follows.

	Option 1	**Option 2**
Address	localhost	localhost
Protocol	HTTP	HTTPS
Port	8084	8083

You may use any internet browser, but there may be issues when adapting JQuery JavaScript library, or using HTTPS certification. You may refer to the trouble-shooting guide 'BioMini_Web_Agent_TS Guide.pdf' or contact technical support to solve the issues.

Basic use of each functions on Web-API is based on URL. For example, you can initialize the device (UFS_InitDevice in native language API), by accessing API URL 'https://localhost:8083/api/initDevice'. The input parameters can be delivered with JSON formatted text such as { sHandle:99999, brightness: 100 }.
You can also get the server response by parsing the JSON formatted text such as { brightness: 100, sensitivity: 3, ... } delivered from the server.</fs>

Session Management

For security reasons, some API can't share data with access from another web page. You need a basic understanding of session cookie to prevent some security related issues.

When the API (ex. captureSingle) which uses 'session' is called, new specific session will be opened. Once the connection with the device is established (session is open), the access from another web browser (ex. Chrome, IE) is always blocked. When the session is open, Web-agent keeps unique session information which is corresponding to a combination of current device handle, session cookie and Page ID (optional) until the connection is lost.

You can manage the session by using 'createSessionID' and 'sessionClear' APIs. You can also control the access from another tab in the same browser by using 'Page ID' (which is optionally provided). In order to enable this, send Page ID when accessing the API (which enables session checking – refer the below chart) is called. Basically Page ID is a non-reproducible number. It is assumed to be generated by client, and sent to the web-agent. The following example would help to implement your own application session blocking.

The condition to disable session is classified into two conditions. 1st condition is that any operation is not issued for the pre-defined timeout period (default value is set up as 5 minutes). And the 2nd is that page calls 'sessionClear' API. 2nd condition is controlled by JavaScript, and can be bound to the

page unload event.

Constraints

- Session Cookie is generated only once. In case of provided example, session cookie is generated when the page is loaded
- If session cookie is not set, web-agent gets error (No session cookie is passed)

Example

```
var pageID = ;

function InitPage()  {
    pageID =  Math.random();
 }
```

	Session Check APIs	No Session Check APIs
/api/	isFingerOn	initDevice
	captureSingle	uninitDevice
	startCapturing	getScannerStatus
	autoCapture	getParameters
	getTemplateData	setParameters
	getImageData	abortCapture
	saveImageBuffer	version
/db/	update	abortIdentify
	enroll	deleteAll
	verify	delete
	verifyTemplate	queryData
	identify	
	getTemplateData	

6.2 WebAgent APIs

Device control APIs

---

api/createSessionID
: This API creates new session and returns sessionID which can be used to create a cookie by the web application. Session ID consists of current time and client's IP address. Refer the below example

api/sessionClear
: This API clears existing session which was created by createSessionID API. If page ID for the session is existing, you should send page ID (parameter_id) to get the authority to clear it

api/version
: add description

api/initDevice
: Equivalent to UFS_Init & UFS_Update API. UFS_Update is functionally integrated in this API and went to be obsolete

api/uninitDevice
: Equivalent to UFS_Uninit API

api/close
: Unloads BioMini PC SDK and prepare exit. This API call causes the background server to be end. User should run BioMini_WebAgent.exe again to use Web-API again

api/getScannerStatus
: Gets scanner with the given device index value

api/isFingerOn
: Returns results whether any finger is on the scanner

api/setParameters
: Sets scanner option parameters composed of one or more of the followings

api/getParameters
: Gets scanner option parameters composed of one or more of the parameters as described at 'setParameters' API section

api/captureSingle
: Start capturing a fingerprint image without any preview images

api/startCapturing
: Starts capturing thread to be stopped by timeout (set with 'setParameters' API). You may finish the running thread by calling 'abortCapture' API

api/autoCapture

Starts iterative capturing process of waiting for the finger and capture the image automatically. The iteration can be canceled by ‘abortCapture’ API

api/abortCapture
Aborts capture thread running by calling ‘startCapturing’ or ‘autoCapture’ API

api/getTemplateData
Extract template from the last captured image

api/getImageData
Get image data in base64 format from the last captured image

api/saveImageBuffer
Saves a fingerprint image at the specific remote folder. User may access the file and download it

Enrollment test APIs

---

db/enroll
Enrolls user data into a memory managed by SDK. If ‘userSerialNo’ is bigger than the last index of previously enrolled data, will add new user. ‘userSerialNo’ should be in the rage of 0 to N. Data is never saved in the fixed disk – all data will be gone if the web-agent is terminated. Web-agent tries 4 times fingerprint capture to enroll the user, instead of 1 time fingerprint capture in default mode (0)

|db/verify
Verifies selected user (should be enrolled previously) is matched with currently selected user

db/identify
Returns identification result of scanned fingerprint by comparing with registered users in the Web-agent software

db/update
Updates specified user data in web-agent

db/delete
Deletes specified user data in web-agent

db/deleteAll
Delete all the user data in web-agent

db/queryData
Retrieves all the user information registered

db/abortIdentify

Aborts currently running identifying process. If the capturing process is running, this API has no effect

db/getTemplateData

Aborts currently running identifying process. If the capturing process is running, this API has no effect

Image APIs

---

img/captureImgbmp

Get captured image file from ‘captureSingle’ API. When the time is up, this image data disappears automatically. So ‘captureSingle’ API is needed to pass resetTimer value

img/previewImgbmp

Get preview image file from ‘startCapturing’ or ‘autoCapture’ API for IE browser. Refer to the example code(BiominiWebAgent.js) to update preview image continuously

img/previewStreaming.bmp

Web-page application would provide a preview image by accessing virtual preview image file, named previewStreaming.bmp. Preview image is updated from the time ‘startCapturing’ or ‘autoCapture’ API called. Any refreshing technic is not needed to get the newly captured image, for this virtual file access. This API does not support IE browser. For the IE browsers, you have to use ‘previewImg.bmp’ instead

img/convertedCaptureImage.bmp(.dat/ .wsq)

You can convert the image at the capture buffer to the image format by simply calling ‘convertedCaptureImage.[extension]’. Each image file extension insists ‘bmp for windows bitmap image file’, ‘dat for ISO 19794-4 fingerprint image file’ and ‘wsq for WSQ compressed fingerprint image format

api/createSessionID

This API creates new session and returns sessionID which can be used to create a cookie by the web application. Session ID consists of current time and client's IP address. Refer the below example.

Examples

```
function InitPage ()  {
    jQuery.ajax({
        type: "GET",
        url: urlStr + "/api/createSessionID",
        dataType: "json"
        success: function (msg) {
            if (msg.retValue == ) {
               session Id = msg.sseionId;
               //TODO: session ID can be used to set cookie.
            }
        },
        error: function (request, status, error) {
            // TODO: your error handling code
        }
     }};
}
```

Returns Session ID like. {"sessionID":"20151129483_2130706433"}

api/sessionClear

This API clears existing session which was created by createSessionID API. If page ID for the session is existing, you should send page ID (parameter : id) to get the authority to clear it.

Examples

```
function DeletePage ()  {
    jQuery.ajax({
        type: "GET"
        url: urlStr + "/api/sessionClear",
        data: {
           id: pageID
        }
    });
}
```

Parameters : id(pageID)

api/version

Examples

```
 function Init ()  {
     jQuery.ajax({
         type: "GET"
         url: urlStr + "/api/version",
         datatype: "json",
         success: function (msg) {
         if (msg.retValue == ) {
            api version = msg.api;
            //TODO: API version can be used to deal with compatibility
         }
     }
     error: function (request, status, error) {
         // TODO: your error handling code
     }
  }};
}
```

Returns API version like : {“api”:“0.1”}

api/initDevice

Equivalent to UFS_Init & UFS_Update API. UFS_Update is functionally integrated in this API and went to be obsolete.

Examples

```
function Init ()  {
    jQuery.ajax({
        type: "GET"
        url: urlStr + "/api/initDevice",
        datatype: "json",
        success: function (msg) {
        if (msg.retValue == ) {
           deviceInfos = msg.ScannerInfos;
           //TODO: add enumerated scanners info to your HTML page
        }
    }
    error: function (request, status, error) {
        // TODO: your error handling code
    }
  }};
}
```

Return value : Device information composed of the followings.

Category	Name	Description	Etc
-	ScannerCount		
ScannerInfos	DeviceIndex	Sequential device index of an order of enumeration	
	Scannername	Scanner name composed of model name, serial number and extra digits	
	DeviceHandle	Device handle value same as HUFScanner in native SDK	
	DeviceType	User friendly scanner model name	
[Common return values]	request	initDevice(echo)	
	retString	Return string(error info)	
	retValue	Return value(error code)	

 # Common return values will be ignored at the following API descriptions.

api/uninitDevice

Equivalent to UFS_Uninit API.

Examples

```
 function unInit ()  {
     jQuery.ajax({
         type: "GET"
         url: urlStr + "/api/uninitDevice",
         datatype: "json",
         success: function (msg) {
         if (msg.retValue == ) {
            deviceInfos = msg.ScannerInfos;
            //TODO: remove listed scanners info from your HTML page
         }
     }
     error: function (request, status, error) {
         // TODO: your error handling code
     }
  }};
}
```

Return value : Device information same as the return value of initDevice API.

api/close

Unloads BioMini PC SDK and prepare exit. This API call causes the background server to be end. User should run BioMini_WebAgent.exe again to use Web-API again.

Return value : None.

api/getScannerStatus

Gets scanner with the given device index value

Examples

```
function OnSelectScannerOptions ()  {
    jQuery.ajax({
        type: "GET"
        url: urlStr + "/api/getScannerStatus",
        datatype: "json",
        data: {
           sHandle: deviceInfos [currentDeviceIndex].DeviceHandle
        success: function (msg) {
           if (msg.retValue == ) {
           //TODO: collect details of the scanner of id 'idx'
        }
    },
    error: function (request, status, error) {
        // TODO: your error handling code
    }
  }};
}
```

Parameters : handle (device handle)

Return value : Device status compose of the followings.

Category	Name	Description	Etc
-	SensorValid	Flag that senses the validity of given device index	
	SensorOn	Flag that senses if device of given device index is turned on	
	IsCapturing	Flag that senses if device of given device index is running or idle	

api/isFingerOn

Returns results whether any finger is on the scanner.

Examples

```
function IsFingerOn ()  {
    jQuery.ajax({
        type: "GET"
        url: urlStr + "/api/isFingerOn",
        datatype: "json",
        data: {
           sHandle: deviceInfos [currentDeviceIndex].DeviceHandle
        },
        success: function (msg) {
           if (msg.retValue == ) {
           //TODO: handle finger-on status
        }
    },
    error: function (request, status, error) {
        // TODO: your error handling code
    }
  }};
}
```

Parameters : handle (device handle)

Return value : Device status compose of the followings.

Category	Name	Description	Etc
-	SensorValid	Flag that senses the validity of given device index	
	FingerOn	Flag that senses if there is a finger on the sensor surface of the device of given device index	

api/setParameters

Sets scanner option parameters composed of one or more of the followings.

Examples

```
function SetSensitivity(isensitivity)  {
    jQuery.ajax({
        type: "GET"
        url: urlStr + "/api/setParameters",
        datatype: "json",
        data: {
           sHandle: deviceInfos [currentDeviceIndex].DeviceHandle
           sensitivity: isensitivity
        },
        success: function (msg) {
           if (msg.retValue == ) {
           //TODO: may update your HTML page
        }
    },
    error: function (request, status, error) {
        // TODO: your error handling code
    }
  }};
}
```

Parameters :

Category	Name	Description	Etc
-	sHandle	Device Handle to set parameters	
	brightness	Fingerprint images brightness	
	fastmode	Matcher option that defines security level	
	securitylevel	Matcher option that defines security level	
	sensitivity	Capture sensitivity option in level	
	Timeout	Capture timeout value in milliseconds	
	templateType	Extractor option of the output file type. Integer range of 1 to 3 that indexes Suprema, ISO 19794-2 or ANSI 378	

api/getParameters

Gets scanner option parameters composed of one or more of the parameters as described at 'setParameters' API section.

Examples

```
function GetSensitivity(isensitivity)  {
    jQuery.ajax({
        type: "GET"
        url: urlStr + "/api/getParameters",
        datatype: "json",
        data: {
           sHandle: deviceInfos [currentDeviceIndex].DeviceHandle
           sensitivity: isensitivity
        },
        success: function (msg) {
           if (msg.retValue == ) {
           //TODO: may update your HTML page
        }
    },
    error: function (request, status, error) {
        // TODO: your error handling code
    }
  }};
}
```

Parameters :

Category	Name	Description	Etc
-	sHandle	Device Handle to get parameters	
	brightness	Fingerprint images brightness	
	fastmode	Matcher option that defines security level	
	securitylevel	Matcher option that defines security level	
	sensitivity	Capture sensitivity option in level	
	Timeout	Capture timeout value in milliseconds	
	templateType	Extractor option of the output file type. Integer range of 1 to 3 that indexes Suprema, ISO 19794-2 or ANSI 378	

api/captureSingle

Start capturing a fingerprint image without any preview images.

Examples

```
  function CaptureSingle()  {
      if (isExistScannerHandle() == false) {
         alert('Scanner Init First');
         return;
      }

      clearTimeout(flag);
      $('#Fpimg').attr('src',
'');
      alert("Placed your Finger on Camera");

      jQuery.ajax({
          type: "GET"
          url: urlStr + "/api/captureSingle",
          datatype: "json",
          data: {
             sHandle: deviceInfos [selectedDeviceIndex].DeviceHandle
             id: pageID,
             resetTimer: delayVal
             sensitivity: isensitivity
          },
          success: function (msg) {
             AppendLog("captureSingle", msg.retString);
             if (msg.retValue == ) {
             //TODO: display or save the last captured image
          }
      },
      error: function (request, status, error) {
          // TODO: your error handling code
      }
   }};
 }
```

Parameters :

Category	Name	Description	Etc
-	sHandle	Device Handle to set parameters	
	id	Client Page ID to manage client session	
	resetTimer	Fingerprint images and template data is removed for the security reason.'resetTimer'parameter sets the life-time of last capture data in milliseconds. Default value is 30,000. Valid range is 5,000 to 600,000	

api/startCapturing

Starts capturing thread to be stopped by timeout (set with 'setParameters' API). You may finish the running thread by calling 'abortCapture' API.

Examples

```
function StartCapture()  {
    if (isExistScannerHandle() == false) {
       alert('Scanner Init First');
       return;
    }

    jQuery.ajax({
        type: "GET"
        url: urlStr + "/api/startCapturing",
        datatype: "json",
        data: {
           sHandle: deviceInfos [selectedDeviceIndex].DeviceHandle
           id: pageID,
           resetTimer: delayVal
        },
        success: function (msg) {
           //TODO: do something to enable preview
        }
    },
    error: function (request, status, error) {
        // TODO: your error handling code
    }
  }};
}
```

Parameters : sHandle (device handle), id (page ID), resetTimer (delay value)

api/autoCapture

Starts iterative capturing process of waiting for the finger and capture the image automatically. The iteration can be canceled by 'abortCapture' API

Examples

```
  function AutoCapture()  {
      if (isExistScannerHandle() == false) {
         alert('Scanner Init First');
         return;
      }

      clearTimeout(flag);
      jQuery.ajax({
          type: "GET"
          url: urlStr + "/api/autoCapturing",
          data: {
             sHandle: deviceInfos [selectedDeviceIndex].DeviceHandle
             id: pageID,
          },
          success: function (msg) {
             //TODO: do something to enable preview
      },
      error: function (request, status, error) {
          // TODO: your error handling code
      }
   }};
}
```

Parameters : sHandle (device handle), id (page ID)

api/abortCapture

Aborts capture thread running by calling ‘startCapturing’ or ‘autoCapture’ API.

Examples

```
  function AutoCapture()  {
      jQuery.ajax({
          type: "GET"
          url: urlStr + "/api/abortCapturing",
          dataType: "json"
          data: {
             sHandle: deviceInfos [selectedDeviceIndex].DeviceHandle
             resetTimer: delayVal
          },
          success: function (msg) {
              if (msg.retValue == ) {
             //TODO: scanning process safely aborted
             }
          },
          error: function (request, status, error) {
          // TODO: your error handling code
      }
    }};
}
```

Parameters : sHandle (device handle), resetTimer (delay value)

api/getTemplateData

Extract template from the last captured image.

Examples

```
function GetTemplateData()  {
    jQuery.ajax({
        type: "GET"
        url: urlStr + "/api/getTemplateData",
        dataType: "json"
        data: {
           sHandle: deviceInfos [selectedDeviceIndex].DeviceHandle
           id: pageID,
           encrypt: encryptmode,
           encryptkey: encryptkey,
           extractEX: extractExMode,
           qualityLevel: qualityLevVal
        },
        success: function (msg) {
            if (msg.retValue == ) {
               //TODO: handle template data encoded in base64 format
               templateData = msg.templateBase64;
           }
        },
        error: function (request, status, error) {
        // TODO: your error handling code
    }
  }};
}
```

Parameters :

Category	Name	Description	Etc
-	sHandle	Device Handle to set parameters	
	id	Client Page ID to manage client session	
	encrypt	Template data encryption mode. 1 for encrypted template, 0 for raw template	
	encryptKey	The key value of template data encryption. Unpredictable text within size of 8 (MAX) characters preferred	
	extractEx	Boolean flag that defines 'extract' API option. 1 for using extended mode (enables larger size template), 0 for default	
	quality	Threshold of extracted template quality	

api/getImageData

Get image data in base64 format from the last captured image.

Examples

```
function GetImageData()  {
    jQuery.ajax({
        type: "GET"
        url: urlStr + "/api/getImageData",
        dataType: "json"
        data: {
           sHandle: deviceInfos [selectedDeviceIndex].DeviceHandle
           id: pageID,
           fileType: formatType // 1: BMP*, 2: 19794-4, 3: WSQ
           compressionRatio: compRatioVal
        },
        success: function (msg) {
            if (msg.retValue == ) {
               //TODO: handle 'bmp' image data encoded in base64 format
               imageData = msg.templateBase64;
           }
        },
        error: function (request, status, error) {
        // TODO: your error handling code
    }
  }};
}
```

Parameters :

Category	Name	Description	Etc
-	sHandle	Device Handle to set parameters	
	id	Client Page ID to manage client session	
	fileType	File type selection option for ‘saveImageBuffer’ API. 1 for ‘bmp’ image, 2 for ISO 19794-4, and 3 for WSQ file format	
	compressionRatio	Compression ratio of image. Valid range is 0.1 to 1	

api/saveImageBuffer

Saves a fingerprint image at the specific remote folder. User may access the file and download it.

Examples

```
function LoadConvertedImageBuffer(imgUrl) {
   var iframe = document.createElement("iframe");
   iframe.src = imgUrl;
   iframe.style.display = "none";
   document.body.appendchild(iframe);
}

function SaveImageBuffer()  {
    jQuery.ajax({
        type: "GET"
        url: urlStr + "/api/saveImageBuffer",
        dataType: "json"
        data: {
           sHandle: deviceInfos [selectedDeviceIndex].DeviceHandle
           id: pageID,
           fileType: formatType // 1: BMP*, 2: 19794-4, 3: WSQ
           compressionRatio: compRatioVal
        },
        success: function (msg) {
            if (msg.retValue == ) {
                if(formatType == 1)
                   LoadConvertedImageBuffer(
                   urlStr + "/img/convertedCaptureImage.bmp");
                else if(formatType == 2)
                  LoadConvertedImageBuffer(
                  urlStr + "/img/convertedCaptureImage.dat");
                else if(formatType == 3)
                  LoadConvertedImageBuffer(
                  urlStr + "/img/convertedCaptureImage.wsq");
           }
        },
        error: function (request, status, error) {
        // TODO: your error handling code
    }
  }};
}
```

Parameters : same as parameter of 'getImageData' API

Return value : 1~3 integer variable stands for the type of files. Intput variable 'dataType' and return value should be the same. 1: BMP, 2: 19794-4, 3: WSQ
If target folder(html/img/) doesn't have a permission to write file, this api returns error string of 'cannot write file'. To solve this problem, refer to the details of measures below

1) Execute web-agent as an administrator
2) Give write permission to the target folder.

db/enroll

Enrolls user data into a memory managed by SDK. If ‘userSerialNo’ is bigger than the last index of previously enrolled data, will add new user. ‘userSerialNo’ should be in the rage of 0 to N. Data is never saved in the fixed disk – all data will be gone if the web-agent is terminated. Web-agent tries 4 times fingerprint capture to enroll the user, instead of 1 time fingerprint capture in default mode (0).

Examples

```
 function Enroll()  {
     jQuery.ajax({
         type: "GET"
         url: urlStr + "/db/enroll",
         dataType: "json"
         data: {
            sHandle: deviceInfos [selectedDeviceIndex].DeviceHandle
            id: pageID,
            UserID: strUserID,
            selectTemplate: selectTemplateOpt,
            encrypt: encryptMode,
            encryptkey: encryptkey,
            extractEx: extractExMode,
            qualityLevel: qualityLevVal
         },
         success: function (msg) {
             if (msg.retValue == ) {
                 // TODO: scannig process safely aborted
            }
         },
         error: function (request, status, error) {
         // TODO: your error handling code
     }
  }};
}
```

Parameters :

Category	Name	Description	Etc
-	sHandle	Device Handle	
	id	PageID	
	userID	Identical user ID(string)	
	userSerialNo	Identical user serial number(0~N-1)	
	selectTemplate	Select template mode. selects 2 number of good templates from 4 number of input template	
	encrypt	Template data encryption mode. 1 for encrypted template, 0 for raw template	
	encryptKey	The key value of template data encryption. Unpredictable text within size of 8 (MAX) characters preferred	
	encrypEx	Boolean flag that defines 'extract' API option	
	qualityLevel	Threshold of extracted template quality	

db/verify

Verifies selected user (should be enrolled previously) is matched with currently selected user.

Examples

```
  function Verify()  {
      jQuery.ajax({
          type: "GET"
          url: urlStr + "/db/verify",
          dataType: "json"
          data: {
          sHandle: deviceInfos [selectedDeviceIndex].DeviceHandle
          id: pageID,
          UserSerialNo: numEnrolledUser,
          extractEx: extractExMode,
          qualityLevel: qualityLevVal

          },
          success: function (msg) {
              if (msg.retValue == ) {
                  // TODO: matching succeeeded, you should handle the result
             }
          },
          error: function (request, status, error) {
          // TODO: your error handling code
      }
    }};
}
```

Parameters : sHandle, id(pageID), userSerialNo, extractEx, qualityLevel

db/identify

Returns identification result of scanned fingerprint by comparing with registered users in the Web-agent software.

Examples

```
function Identify()  {
    jQuery.ajax({
        type: "GET"
        url: urlStr + "/db/identify",
        dataType: "json"
        data: {
        sHandle: deviceInfos [selectedDeviceIndex].DeviceHandle
        id: pageID,
        extractEx: extractExMode,
        qualityLevel: qualityLevVal
        },
        success: function (msg) {
            if (msg.retIdentify == 1) {
                // TODO: matching failed, you should handle the result
           }
           else {
              // TODO: matching succeeded, you should handle the result
        },
        error: function (request, status, error) {
        // TODO: your error handling code
    }
  }};
}
```

Parameters : sHandle (device handle), id(pageID), extractEx, qualityLevel

Return value : retIdentify (-1: does not match with any of registered templates, others: index of matched user)

db/update

Updates specified user data in web-agent.

Examples

```
 function Update()  {
     jQuery.ajax({
         type: "GET"
         url: urlStr + "/db/update?dummy" + Math.random(),
         dataType: "json"
         data: {
            sHandle: deviceInfos [selectedDeviceIndex].DeviceHandle
            id: pageID,
            userSerialNo: selectedUserNo,
            extractEx: cb_extractExMode,
            qualityLevel: document.getElementById("DDb_Q1tyLv").value
         },
         success: function (msg) {
             if (msg.retValue == ) {
                 // TODO: updating process safely finished
            }
         },
         error: function (request, status, error) {
         // TODO: your error handling code
     }
  }};
}
```

Parameters : sHandle (device handle), id(pageID), extractEx, qualityLevel

db/delete

Deletes specified user data in web-agent.

Examples

```
  function Delete()  {
      jQuery.ajax({
          type: "GET"
          url: urlStr + "/db/delete",
          dataType: "json"
          data: {
             sHandle: deviceInfos [selectedDeviceIndex].DeviceHandle
             userSerialNo: selectedUserNo,
          },
          success: function (msg) {
              if (msg.retValue == ) {
                  // TODO: updating process safely finished
             }
          },
          error: function (request, status, error) {
          // TODO: your error handling code
      }
    }};
}
```

Parameters : sHandle (device handle), userSerialNo

db/deleteAll

Delete all the user data in web-agent.

Examples

```
  function DeleteAll()  {
      jQuery.ajax({
          type: "GET"
          url: urlStr + "/db/deleteAll",
          dataType: "json"
          success: function (msg) {
                  // TODO: deleting process safely finished
          },
          error: function (request, status, error) {
          // TODO: your error handling code
      }
    }};
}
```

db/queryData

Retrieves all the user information registered.

Examples

```
  function QueryData()  {
      jQuery.ajax({
          type: "GET"
          url: urlStr + "/db/queryData",
          dataType: "json"
          data: {
             sHandle: deviceInfos[selectedDeviceIndex].DeviceHandle,
          },
          success: function (msg) {
             if (msg.retValue == ) {
                var n users = parseInt(msg.db.size);
                for (var i = ; i < n_users; i++) {
                   var id i = msg.db[i].id;
                   var tmp2 size = msg.db[i].template2;
                   if (tmp2 size == ) {
                       // the enrolled type is 1-template
                   }
                   else {
                       // the enrolled type is 2-template
                       type_i = 1;
                   }
                   // handle the enrolled type (type_i == 0: 1-template)
                   // handle the data queried
                }
             }

          },
          error: function (request, status, error) {
          // TODO: your error handling code
      }
    }};
  }
```

Parameters : sHandle (device handle)

Return value

Category	Name		Description	Etc
db	size		Size of database (number of users registered)	
	index(integer) * indices are at the range of 0~(size-1) total number of indices is 'size'.	id	User ID (name) of the enrolled template	
		template1	1st template data size	
		quality1	1st template quality (if the templates are captured with ‘select template’ option, quality1 is always 100.	
		template2	2nd template data size	
		quality2	2nd template quality (if the templates are captured with ‘select template’ option, quality2 is always 100.	

db/abortIdentify

Aborts currently running identifying process. If the capturing process is running, this API has no effect.

Examples

```
 function QueryData()  {
     jQuery.ajax({
         type: "GET"
         url: urlStr + "/db/abortIdentify",
         dataType: "json"
         data: {
         success: function (msg) {
            if (msg.retValue == ) {
                // TODO: succeeded, you should handle the result
             }
          },
         error: function (request, status, error) {
         // TODO: your error handling code
     }
  }};
}
```

db/getTemplateData

Aborts currently running identifying process. If the capturing process is running, this API has no effect.

Examples

```
  function SaveTemplate()  {
      jQuery.ajax({
          type: "GET"
          url: urlStr + "/db/getTemplateData",
          dataType: "json"
          data: {
          sHandle: deviceInfos[selectedDeviceIndex].DeviceHandle,
          id: pageID,
          userSerialNo: selectedUserNo,
          encrypt: encryptMode,
          encryptkey: encryptkeyVal,
       }
       success: function (msg) {
          if (msg.retValue == ) {
              // TODO: handle template data encoded in base64 format
              templateData = msg.templateBase64;
              }
           },
          error: function (request, status, error) {
          // TODO: your error handling code
      }
    }};
}
```

Parameters : sHandle (device handle), id (Page ID), userSerialNo, encrypt, encryptKey

Category	Name	Description	Etc
-	sHandle	Device Handle	
	id	PageID	
	userSerialNo	Identical user serial number(0~N-1)	
	encrypt	Template data encryption mode. 1 for encrypted template, 0 for raw template	
	encryptKey	The key value of template data encryption. Unpredictable text within size of 8 (MAX) characters preferred	

img/captureImg.bmp

Get captured image file from ‘captureSingle’ API. When the time is up, this image data disappears automatically. So ‘captureSingle’ API is needed to pass resetTimer value.

Examples

```
function LoadImage()  {
   var sessionData = "&shandle=" + deviceInfos[currentIdx].DeviceHandle
      + "&id=" + pageID;

   $('#Fpimg').removeAttr();
   $('#Fpimg').attr("src", urlStr+"/img/captureImg.bmp" + sessionData);

 }
```

Parameters : sHandle(device handle), id(Page ID)

img/previewImg.bmp

Get preview image file from ‘startCapturing’ or ‘autoCapture’ API for IE browser. Refer to the example code(BiominiWebAgent.js) to update preview image continuously.

Examples

```
function PreviewLoop()  {
   var sessionData = "&shandle=" + deviceInfos[currentIdx].DeviceHandle
      + "&id=" + pageID;
   var imgUrl = urlStr + "/img/previewImg.bmp" + sessionData;

   $('#Fpimg').removeAttr();
   $('#Fpimg').attr("src", imgUrl);
}}
```

Parameters : sHandle(device handle), id(Page ID)

img/previewStreaming.bmp

Web-page application would provide a preview image by accessing virtual preview image file, named previewStreaming.bmp. Preview image is updated from the time ‘startCapturing’ or ‘autoCapture’ API called. Any refreshing technic is not needed to get the newly captured image, for this virtual file access. This API does not support IE browser. For the IE browsers, you have to use ‘previewImg.bmp’ instead.

Examples

```
function PreviewOnChecked()  {
   var browser = navigator.userAgent.toLowerCase();

   if(browser.indexOf("chrome") != -1){
      var imgUrl = urlStr + "/img/previewStreaming.bmp" + sessionData;

      $('#Fpimg').removeAttr();
      $('#Fpimg').attr("src", imgUrl);
   }
}}
```

Parameters : sHandle(device handle), id(Page ID)

img/convertedCaptureImage.bmp(.dat/.wsq)

You can convert the image at the capture buffer to the image format by simply calling ‘convertedCaptureImage.[extension]’. Each image file extension insists ‘bmp for windows bitmap image file’, ‘dat for ISO 19794-4 fingerprint image file’ and ‘wsq for WSQ compressed fingerprint image format.

Examples

```
function LoadConvertedImageBuffer()  {
   var iframe = document.createElement("ifame");
   iframe.src = urlStr + "/img/convertedCaptureImage.bmp"
   Iframe.style.display = "none";
   Document.body.appendChild(iframe);

}
```

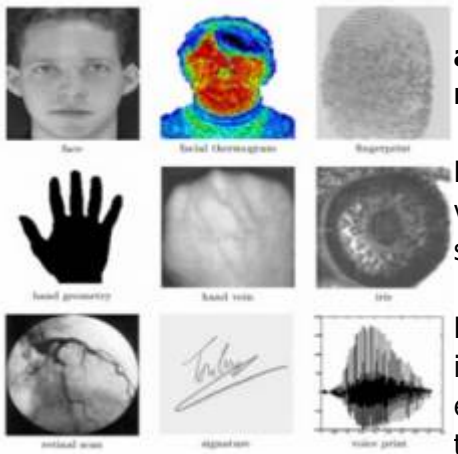
7. Appendix

What is Biometrics?

Identifying individuals based on their distinctive anatomical(fingerprint, face, iris, hand geometry) and behavioral(signature, voice) characteristics is called biometrics. Because biometric identifiers cannot be shared or misplaced, they intrinsically represent an individual's identify. Biometrics is quickly becoming an essential component of effective identification solutions. Recognition of a person by their body, then linking that body to an externally established “identity”, forms a powerful authentication tool.

Fingerprint identification has been widely used for a long time because individual’s unique Fingerprint pattern cannot be shared or misplaced, they essentially represent an individual’s identity. Fingerprint contains rich information in a small area compared to other biological anatomical (face, iris, hand geometry) and behavioral (signature, voice) characteristics. Identifying individuals based on fingerprint is well-known as the most feasible method compared to other biometrical characteristics. Among the other biometric identification methods, fingerprint identification has a good balance of qualities including accuracy, throughput, size and cost of scan devices, maturity of technology and convenience of use, making it the dominant biometric technology in industry.

Two major methods are being used in fingerprint identification; matching based on feature point and filter bank. Matching algorithm based on feature point extract “local minutiae from Thinning fingerprint image or gray scale fingerprint image. Thereafter a method for matching using the location relationship between the feature point in the fingerprint template stored image and the input fingerprint image. he feature point matching takes relatively short processing time however matching performance could be deceased on noised fingerprint images. Filters bank matching algorithm extract fingerprint ridge using Gabor filters bank.



Measured by means of an automated device for physical and behavioral characteristics, Technology to utilize as a means of personal identification

Physical characteristics available - fingerprint, palm print, face, iris veins, etc. Physical and behavioral features available - voice, signature, key tapping, Gait, etc.

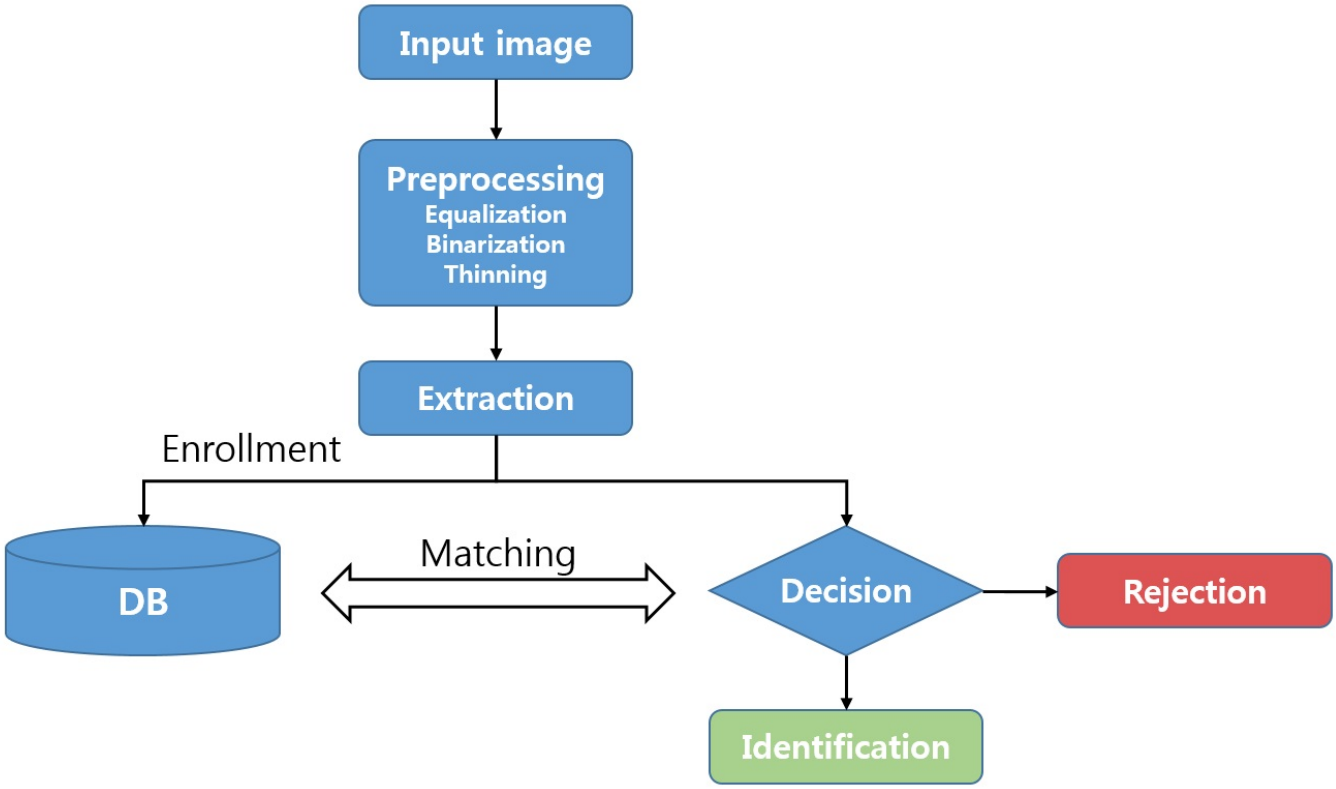
Fingerprint is specified patterned from finger’s sweat gland which is consisting of ridge and Valley. Ridge has a certain direction at even interval. Also Ridge (Ridge) has characteristics where lean towards end from certain direction and the ridge (Ridge) part (Junction birurcation) which is divided into two directions.

Classfication of fingerprint recoginition

Fingerprint recognition is divided into classification (Classification) and matching (Matching). Classification (Classification) is a way of determine that fingerprint belongs to a particular group based on the overall form of a fingerprint. Matching (Matching) is to compare the fingerprints match with the fingerprints stored in the input. Matching (Matching) is divided into 2 different methods; 1: N matching (Identification) and 1: 1 matching (Verification). The extracted fingerprint minute is used to do matching. The minutiae can be divided into Local feature and global feature by its own characteristic The Global feature can be determined by formation of fingerprint and direction pattern of ridge & location of ridge minutiae determines the Local feature.

Fingerprint recoginition

Basic formation of fingerprint recognition system is as below. Preprocess the fingerprint image which was entered by fingerprint reader. Then recognize the fingerprint by extracting the features and comparing with saved fingerprint data stored in database.



a. Preprocessing

To extract features from the fingerprint image, follow through below process. Clarifying the image by removing the noise and also ridge ending, minutiae placement, crossed features caused by the noise. This process is called the preprocessing. Here, 3 preprocessing methods are performed; smoothing, binarization and thinning.

b. Feature Extraction

Fingerprint features can be performed as below methods; End point of ridge, minutiae placement, ridge direction pattern, connecting information between core and ridge, local feature containing ridge formation.

The feature extraction can be effected by fingerprint pressure, direction, location, placement, and condition of the fingerprint.

c. Feature Matching

The matching is comparing saved template pattern in the database with fingerprint features taken from the device. To determine the match, may use pattern matching, statistics identification, structure identification.

About FAR, FRR and EER

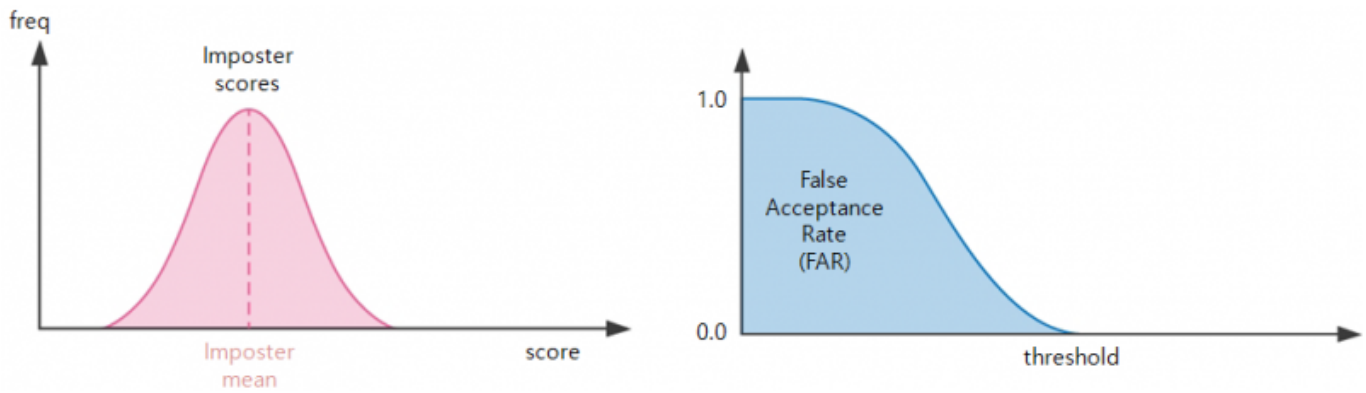
Here, we discusses some general principles of biometric recognition systems, describes different classification errors and explains how the quality of two systems can be compared objectively.

a. Identification vs. Verification

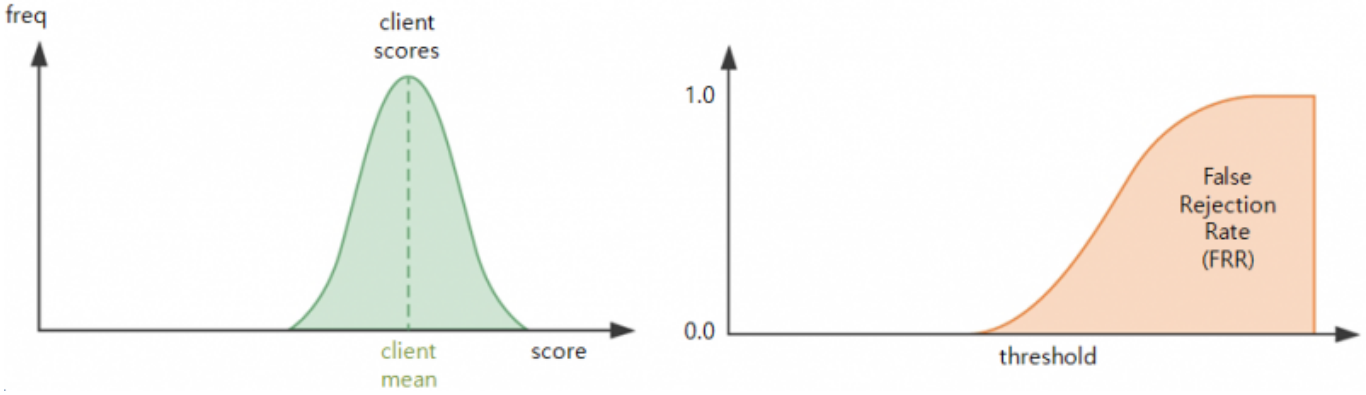
A biometric recognition system can run in two different modes: identification or verification. Identification is the process of trying to find out a person's identity by examining a biometric pattern calculated from the person's biometric features. In the identification case, the system is trained with the patterns of several persons. For each of the persons, a biometric template is calculated in this training stage. A pattern that is going to be identified is matched against every known template, yielding either a score or a distance describing the similarity between the pattern and the template. The system assigns the pattern to the person with the most similar biometric template. To prevent impostor patterns (in this case all patterns of persons not known by the system) from being correctly identified, the similarity has to exceed a certain level. If this level is not reached, the pattern is rejected. In the verification case, a person's identity is claimed a priori. The pattern that is verified only is compared with the person's individual template. Similar to identification, it is checked whether the similarity between pattern and template is sufficient to provide access to the secured system or area.

b. Thresholding (False Acceptance / False Rejection)

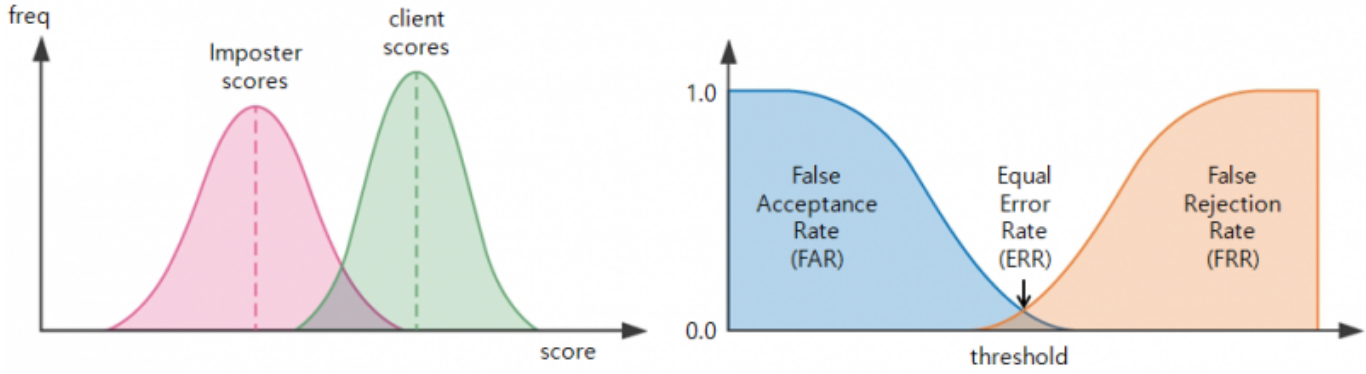
The threshold depending fraction of the falsely accepted patterns divided by the number of all impostor patterns is called **False Acceptance Rate (FAR)**. Its value is one, if all impostor patterns are falsely accepted and zero, if none of the impostor patterns is accepted. Look on the graphic on the right to see the values of the FAR for the score distribution of the left image for varying threshold.



Now let's change to the client patterns. Similar to the impostor scores, the client pattern's scores vary around a certain mean value. The mean score of the client patterns is higher than the mean value of the impostor patterns, as shown in the left of the following two images. If a classification threshold that is too high is applied to the classification scores, some of the client patterns are falsely rejected. Depending on the value of the threshold, between none and all of the client patterns will be falsely rejected. The fraction of the number of rejected client patterns divided by the total number of client patterns is called **False Rejection Rate (FRR)**. According to the FAR, its value lies in between zero and one. The image on the right shows the FAR for a varying threshold for the score distribution shown in the image on the left.



The choice of the threshold value becomes a problem if the distributions of the client and the impostor scores overlap, as shown in the next image on the left. On the right, the corresponding false acceptance and false rejection rates are displayed.



Note that if the score distributions overlap, the FAR and FRR intersect at a certain point. The value of the FAR and the FRR at this point, which is of course the same for both of them, is called the **Equal Error Rate (EER).**

Scanners
BioMini Plus2

FBI PIV Approved Authentication Scanner
BioMini Plus 2 is an USB fingerprint scanner designed to provide high level security solution for identity access management solutions. BioMini Plus 2 features Suprema’s latest live finger detection technology for protection against fake fingerprints. The device features sleek and ergonomic design with scratch resistant IP65 sensor surface securing high usability. The usability is further extended with integration of MDR technology that allows effective capture of fingerprints even under direct sunlight. Combined with its comprehensive SDK solution, BioMini Plus 2 is a versatile and optimal platform for system integrators, hardware manufacturers and security companies.

Specification

Main
- Sensor Type(Optical)
- Resolution(500dpi/256gray)
- Sensing Area(16.0x18.0mm)
- Image Size(315×354 pixels)
- Compression Standards(WSQ)
- Template Format(Suprema,ISO19794-2, ANSI-378)
- Image Format(ISO19794-4)
- IP Rating(IP65)

Interface
- USB(2.0 High-speed)

Hardware
- Operating Temperature(-10°C ~ 50°C)
- Certification(CE,FCC,UL,WHQL,USB-IF RoHS,WEEE)
- Dimensions(66x90x58mm/WxLxH)

Compatibility
- Operating System(Windows, Linux, Android4.1/Jelly Bean and Above)

BioMini Slim

FBI PIV and Mobile ID FAP20 Certified USB Fingerprint Scanner
BioMini Slim has been designed to provide a high level security solution for identity access management solutions for authentication. With IP65 grade dust and waterproof form factor, BioMini Slim features a sleek ergonomic design with the latest 500dpi slim optical sensor, which boasts a large platen size for easy and reliable fingerprints capturing as well as advanced LFD (Live Finger Detection) technology.

Specification

Main

- Sensor Type(Optical)
- Resolution(500dpi/256gray)
- Platen Size(18×25.4mm)
- Sensing Area(17x25mm)
- Image Size(320×480 pixels)
- Compression Standards(WSQ)
- Template Format(Suprema,ISO19794-2, ANSI-378)
- Image Format(ISO19797-4)
- IP Rating(IP65)

Interface

- USB(2.0 High-speed)

Hardware

- Operating Temperature(-10°C ~ 50°C)
- Certification(CE,FCC,KC,UL,WHQL, USB-IF,WEEE)
- Dimensions(82×57.7x27mm/WxLxH)

Compatibility

- Operating System(Windows, Linux, Android4.1/Jelly Bean and Above)

BioMini Combo

Contact Smart Card Reader with USB Fingerprint Scanner
Suprema BioMini Combo has been designed to provide two factor authentication security solutions for authentication purposes. The scanner features Suprema’s latest slim optical sensor with large platen size for easier capturing. Smart card reader functionality and advanced Live Finger Detection technology enhances security makes BioMini Combo a secure platform for developers.

Specification

Main
- Sensor Type(Optical)
- Resolution(500dpi/256gray)
- Platen Size(18×25.4mm)
- Sensing Area(17x25mm)
- Image Size(320×480 pixels)
- Compression Standards(WSQ)
- Template Format(Suprema,ISO19794-2, ANSI-378)
- Image Format(ISO19797-4)

Card Support
- CardType(ISO 7816/EMV 2000with SAM Slot_optical)

Interface
- USB(2.0 High-speed)

Hardware
- Operating Temperature(-10°C ~ 50°C)
- Certification(CE,FCC,KC,UL,WHQL, USB-IF,WEEE)
- Dimensions(82×57.7x27mm/WxLxH)

Compatibility
- Operating System(Windows, Linux)

BioMini Plus

FBI PIV Approved Authentication Scanner
Suprema BioMiniPlus has been designed to provide high level security solution with its proven reliability through FBI-PIV certification. BioMini Plus features hybrid live finger detection (LFD) technology and multi award-winning Suprema Algorithm. Packed in a sleek and ergonomic design, it features durable 500dpi optical sensor and high speed USB 2.0 interface. Combined with its comprehensive SDK solution,

Specification

Main

- Sensor Type(Optical)
- Resolution(500dpi/256gray)
- Sensing Area(15.5×18.8mm)
- Image Size(260×340 pixels)
- Compression Standards(WSQ)
- Template Format(Suprema,ISO19794-2, ANSI-378)
- Image Format(ISO19797-4)
- IP Rating(IP65)

Interface

- USB(2.0 High-speed)

Hardware

- Operating Temperature(-10°C ~ 50°C)
- Certification(CE,FCC,KC,UL,WHQL, USB-IF,WEEE)
- Dimensions(66x90x58mm/WxLxH)

Compatibility

- Operating System(Windows, Linux, Android4.1/Jelly Bean and Above)

BioMini

High Performance Authentication Scanner Our latest range of high performance fingerprint scanners are supported by powerful software development kit (SDK) which features Suprema's award-winning algorithm that ranked 1st in FVC and NIST MINEX tests. Suprema Authentication Scanners offers unrivaled versatile platform for development to leading security companies, system integrators and hardware manufacturers.

Specification

Main

- Sensor Type(Optical)
- Resolution(500dpi/256gray)
- Sensing Area(16x18mm)
- Image Size(288×320 pixels)
- Compression Standards(WSQ)
- Template Format(Suprema,ISO19794-2, ANSI-378)
- Image Format(ISO19797-4)

Interface

- USB(2.0 High-speed)

Hardware

- Operating Temperature(-10°C ~ 50°C)
- Certification(CE,FCC,KC,WHQL)
- Dimensions(66x90x58mm/WxLxH)

Compatibility

- Operating System(Windows, Linux, Android4.1/Jelly Bean and Above)

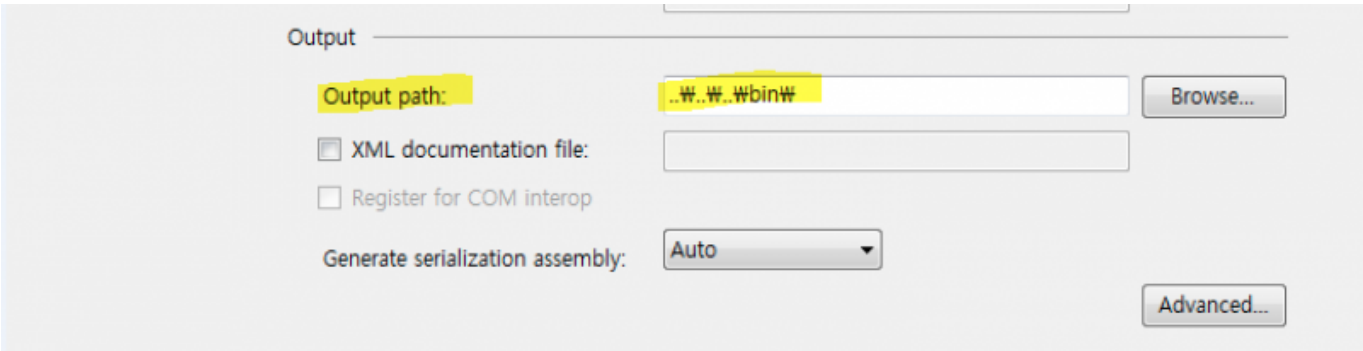
TroubleShooting

Q. When i tried the 'init' on the sample, i faced "ERROR:No license" error(No licensed device or file found).

!!! A. In order to use the BioMini SDK, a scanner should be connected to PC. Please install the driver from <BioMini SDK_HOME>\install\drivers\SFR Driver(unified), and then connect the scanner.

Q. I have an error "Unable to load DLL 'UFScanner.dll': The specified module could not be found. (Exception from HRESULT: 0x8007007E)". How can i solve the error?

A. Please try to do the following way.
1. Check a output path on Reference in Visual Studio as below image.



2. Confirm whether there is the 'UFScanner.dll' file on the output path. If there isn't, put the 'UFScanner.dll' file into the output path.
3. Try doing it again.

Q. I have tried copying all dlls from \bin folder to the bin directory of my project. But it gives the given error: "System.BadImageFormatException: An attempt was made to load a program with an incorrect format. (Exception from HRESULT: 0x8007000B)".

A. You can get the “0x8007000B” error since you used the dll files for 32bit in the 64bit environment, so please put following dll files from \bin\x64 folder into \bin directory of your project and re-build it.

- UFScanner.dll
- UFMatcher.dll
- UFExtract.dll
- Suprema.UFScanner.dll *(This is a wrapper dll. Please copy this if you use the C# language.)*
- Suprema.UFMatcher.dll *(This is a wrapper dll. Please copy this if you use the C# language.)*
- Suprema.UFExtract.dll *(This is a wrapper dll. Please copy this if you use the C# language.)*

Q. When i try to execute a diagnosis tool, i got an error "Unable to start program because mfc120u.dll or msvcr120.dll is not present in your computer".

A. Please download Visual C++ 2013 Redistributable package on the following link according to their environment. https://www.microsoft.com/en-US/download/details.aspx?id=40784

Q. When i click "Create log" on a diagnosis tool, this is crashed.

A. Please run the diagnosis tool as administrator.

Q. [Web agent] When i launched 'BioMini_WebAgent.exe' application, i got “Web-Agent server failed to start" error.

A. If ‘Biomini_WebAgent.exe’ application failed to launch and print “Web-Agent server failed to start” error on the screen, please check the following file’s existence where ‘Biomini_WebAgent.exe’ installed.

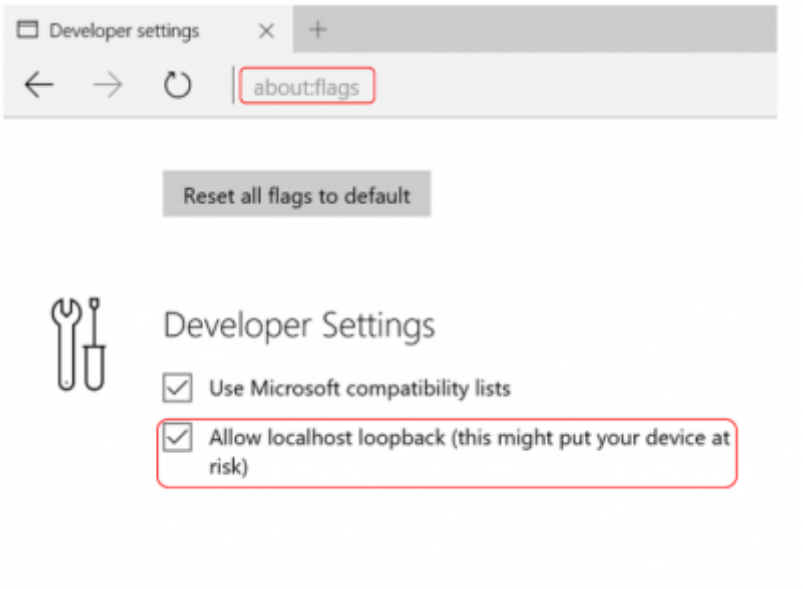
> ssleay32.dll, libeay32.dll

Q. [Web agent] I'm facing “network error 0x2efd" error in Microsoft Edge browser. (Windows 10)

A. - Make sure ‘localhost loopback’ option is enabled. - Run ‘cmd.exe' with Administrator authority, and execute following script.

> CheckNetIsolation.exeLoopbackExempt -a -n=Microsoft.MicrosoftEdge_8wekyb3d8bbwe

- Type about:flagsin the address edit box, and check if “Allow localhost loopback” option is enabled.



Q. [Web agent] I get “This Connection is Untrusted” error on Firefox browser.

A. Click “I Understand the Risks” and then click “Add Exception” button.