



# TrustFinger SDK For Android Developer Guide V2.0

深圳市亚略特科技股份有限公司

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## **Before You Begin**

### **Biometrics Overview**

Biometrics is a method of recognizing a person based on physical or behavioral characteristics. Biometric information that is used to identify people includes fingerprint, voice, face, iris, handwriting, and hand geometry.

There are two key functions offered by a biometric system. One method is identification, a one-to-many (1:N) matching process in which a biometric sample is compared sequentially to a set of stored samples to determine the closest match. The other is verification, a one-to-one (1:1) matching process in which the biometric system checks previously enrolled data for a specific user to verify whether the user is who he or she claims to be. The verification method provides the best combination of speed and security, especially where multiple users are concerned, and requires a user ID or other identifier for direct matching.

With an increasing reliance on online and mobile technology and other shared resources, more and more transactions of all types are initiated and completed online and remotely. This unprecedented growth in electronic transactions has underlined the need for a faster, more secure and more convenient method of user verification than passwords can provide. Using biometric identifiers offers advantages over traditional methods. This is because only biometric authentication is based on the identification of an intrinsic part of a human being. Tokens such as smartcards, magnetic stripe cards and physical keys, can be lost, stolen, duplicated or left behind. Passwords can be forgotten, shared, hacked or unintentionally observed by a third party. By eliminating these potential trouble spots, biometric technology can provide greater security, with convenience, needed for today's complex electronic landscape.

### **Advantages of Using Fingerprints**

The advantages of using fingerprints include widespread public acceptance, convenience and reliability. It takes little time and effort to scan one's fingerprint with a fingerprint reader, and so fingerprint recognition is considered among the least intrusive of all biometric verification techniques. Ancient officials used thumbprints to seal documents thousands of years ago, and law enforcement agencies have been using fingerprint identification since the late 1800s. Fingerprints have been used so extensively and for so long, there is a great accumulation of scientific data supporting the idea that no two fingerprints are alike.

## **About Aratek**

Aratek has been in the business of helping millions manage their digital identity throughout the globe for more than 14 years. We are dedicated to provide cost-effective products and solutions for governments and organizations with sophisticated end-to-end product portfolio ranging from software to fingerprint scanners to multi-functional biometrics terminals.

With our professional and experienced team, we are proud to offer:

- Complete and cost-effective product line
- Large scale manufacturing capacity
- Fast deployment capability
- Flexible specification configuration

## **Aratek Copyright Declaration**

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### **Feedback**

Although we have audited and tested the document before it was published, if you find any errors, omissions, or better suggestions during use, please contact us:

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## **1 System Overview**

The Aratek TrustFinger™ SDK is the one-to many (1:N) matching engine software developer's kit that enables programmers to develop extremely fast, highly accurate fingerprint searching programs for use in large scale fingerprint databases.

The TrustFinger™ SDK can be used for two types of applications:

- To identify unknown individuals by matching fingerprints in a fingerprint database (e. g., searching for missing children, criminal investigations, etc.)
- To replace identification codes with a high security, user-friendly method (e.g., time and attendance systems, member management systems, system login without ID)

The TrustFinger™ SDK supports quick and easy 1:N matching system integration in any fingerprint database application where accuracy and search speed are paramount.

### **Features of TrustFinger™ SDK:**

- Succinct and Powerful APIs

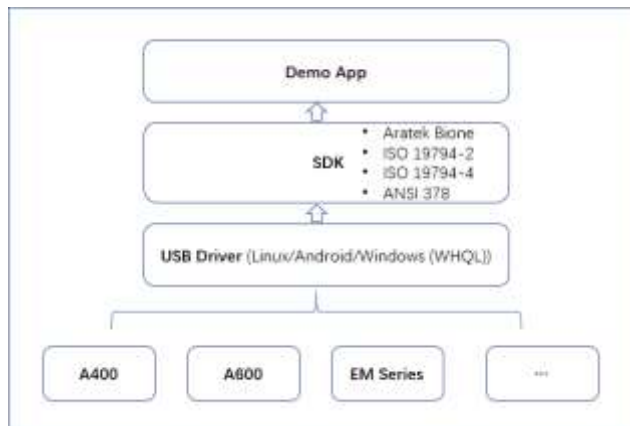
Offers succinct APIs for fingerprint registration and searching so that programmers can easily build fingerprint search systems quickly.

- High accuracy in fingerprint matching

Provides accurate candidate lists with corresponding confidence levels

- High-speed fingerprint searching

Utilizes an innovative indexing-based algorithm that is different from sequential comparison and that increases the search speed over a mass volume of fingerprints.

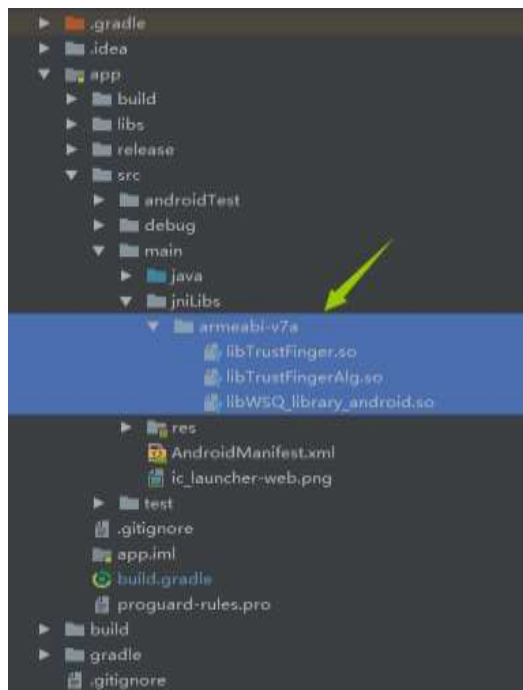




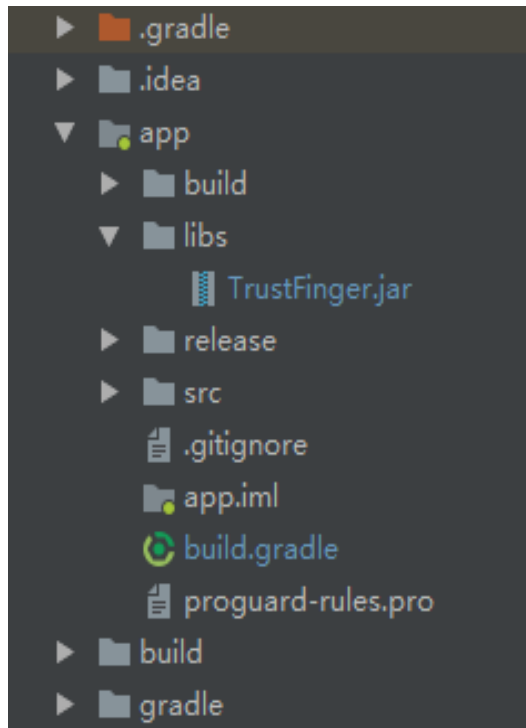
## 2 Quick Start

### 2.1 Setup an Android Studio Project with TrustFinger™ Android SDK

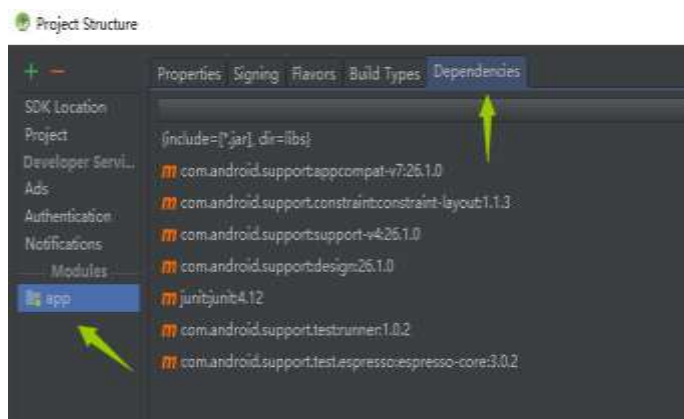
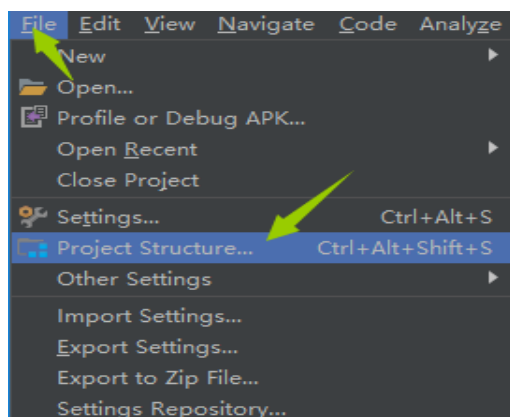
**Step 1:** Create the folder `/app/src/main/jniLibs`, and then put *libTrustFinger.so*, *libTrustFingerAlg.so* and *libWSQ\_library\_android.so* within their abi folders in that location.



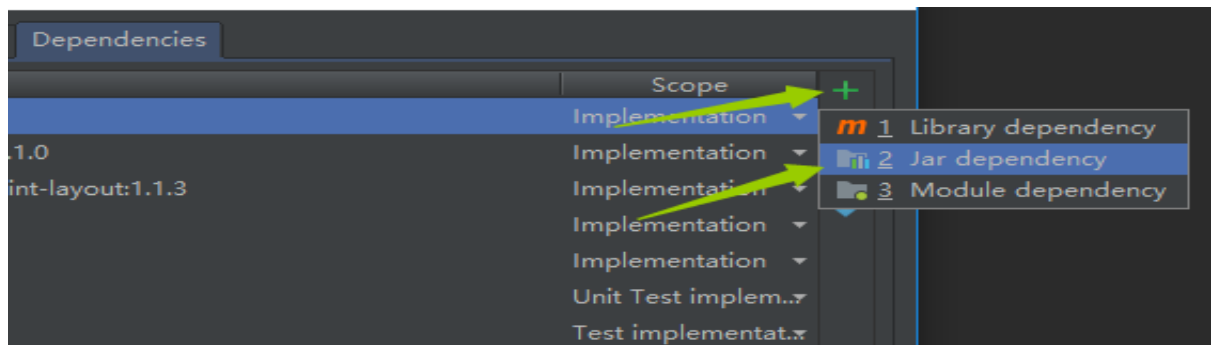
**Step 2:** Copy the *TrustFinger.jar* file into the `libs` folder under `app` folder of your project.



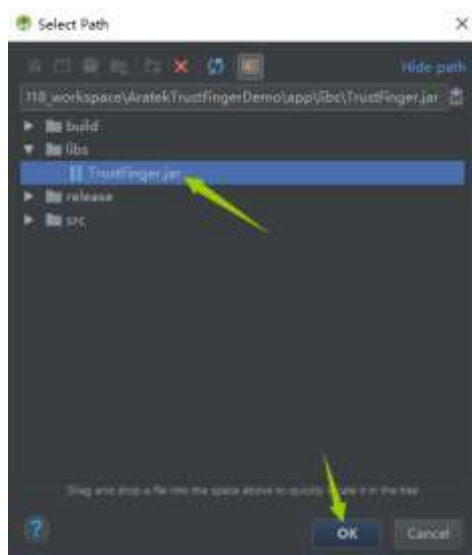
**Step 3:** Click on **File > Project Structure > Select app > Dependencies** Tab.



**Step 4:** Click on (+) plus button given on right side and select **Jar Dependency**.



**Step 5:** This will pop up a dialog box for selecting path. Under this open **libs** folder and add **TrustFinger.jar**.



**Step 6:** Once you select the **TrustFinger.jar** file then click the **OK** button and your Gradle will Start building.

### Important Notes:

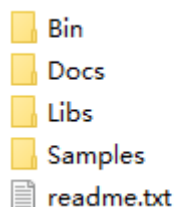
*If you are not able to find libs then you must be viewing your project in “Android” view. On the right side of Android tab you will see the < > symbol. Click on it and select **Project**. This option is available in Android Studio 2.1.*

*If you are using any older version where you can’t find this, then you simply need to*  
[www.aratek.com.cn](http://www.aratek.com.cn)

click on **Android** tab and it will show you a drop down list from that list select **project**.

## 2.2 Directory Description

The SDK folder has the following folders:



Bin - demo apk

Docs - developer user manual

Libs - libraries (\*.jar and \*.so files)

Samples - demo project source code

Readme.txt - document structure and version update information.

## 3 Application Development

A basic application development using the TrustFinger™ SDK can be done by following these steps:

### 3.1 Fingerprint Image Collection

- 1. Call [getInstance\(\)](#) to get device instance, then call [initialize\(\)](#) to initialize the SDK. This process needs to be called only once, and is recommended to be called at the start of the application. However, if you have previously called [getInstance\(\)](#) and [initialize\(\)](#) (i.e. during fingerprint enrollment or fingerprint match as described in Sections 3.2 and 3.3), there is no need to initialize the SDK again.

```
TrustFinger mTrustfinger = TrustFinger.getInstance(getApplicationContext());
mTrustFinger.initialize();
```

- 2. Call [openDevice\(\)](#) to open device.

```
int deviceIndex = 0;
TrustFingerDevice mTrustFingerDevice = null;
mTrustFinger.openDevice(deviceIndex, new DeviceOpenListener(){
    @Override
    public void openSuccess(TrustFingerDevice device){
        mTrustFingerDevice = device;
    }
    @Override
```

- 3. Collect Image.

```
byte[] rawData = mTrustFingerDevice.captureRawData();
```

## 3.2 Fingerprint Enrollment

- 1. Call [getInstance\(\)](#) to get device instance, then call [initialize\(\)](#) to initialize the SDK. This process needs to be called only once, and is recommended to be called at the start of the application. However, if you have previously called [getInstance\(\)](#) and [initialize\(\)](#) (i.e. during fingerprint image collection or fingerprint match as described in Sections 3.1 and 3.3), there is no need to initialize the SDK again.

```
TrustFinger mTrustfinger = TrustFinger.getInstance(getApplicationContext());
mTrustFinger.initialize();
```

- 2. Call [openDevice\(\)](#) to open device.

```
int deviceIndex = 0;

TrustFingerDevice mTrustFingerDevice = null;

mTrustFinger.openDevice(deviceIndex, new DeviceOpenListener(){

    @Override

    public void openSuccess(TrustFingerDevice device){

        mTrustFingerDevice = device;

    }

    @Override
```

- 3. Call [captureRawData\(\)](#) to collect image raw data.

```
byte[] rawData = mTrustFingerDevice.captureRawData();
```

- 4. Image quality check and extract fingerprint features.

```
int imageQuality = mTrustFingerDevice.rawImageQuality();

byte[] featureData;

if(imageQuality >= 50){

    featureData = mTrustFingerDevice.extractFeature();

}else{
```

- 5. Repeat steps 3 and 4 to get 3 features, then combine them together to form a template.
- 6. Call [generalizeTemplate\(\)](#) to combine the 3 features generated in step 5 into a template.

```
byte[] templateData = mTrustFingerDevice.generalizeTemplate(featureData1,
    featureData2, featureData3);
```

- 7. Save the template to complete the fingerprint enrollment.

### 3.3 Fingerprint Match

- 1. Call [getInstance\(\)](#) to get device instance, then call [initialize\(\)](#) to initialize the SDK. This process needs to be called only once, and is recommended to be called at the start of the application. However, if you have previously called [getInstance\(\)](#) and [initialize\(\)](#) (i.e. during fingerprint image collection or fingerprint enrollment as described in Sections 3.1 and 3.2), there is no need to initialize the SDK again.

```
TrustFinger mTrustfinger = TrustFinger.getInstance(getApplicationContext());  
- ... ..
```

- 2. Call [openDevice\(\)](#) to open device.

```
int deviceIndex = 0;  
TrustFingerDevice mTrustFingerDevice = null;  
mTrustFinger.openDevice(deviceIndex, new DeviceOpenListener(){  
    @Override  
    public void openSuccess(TrustFingerDevice device){  
        mTrustFingerDevice = device;  
    }  
    @Override
```

- 3. Call [captureRawData\(\)](#) to collect image raw data.

```
byte[] rawData = mTrustFingerDevice.captureRawData();
```

- 4. Image quality check and extract fingerprint features.

```
int imageQuality = mTrustFingerDevice.rawImageQuality();

byte[] featureData;

if(imageQuality >= 50){

    featureData = mTrustFingerDevice.extractFeature();

}else{
```

- 5. Call [verify\(\)](#) to verify two features.

```
VerifyResult verifyResult = mTrustFingerDevice.verify(SecurityLevel.Level4,
featureData1, featureData2);

int similarity = 0;

if(verifyResult.error == 0){

    if(verifyResult.isMatched){

        // match

        similarity = verifyResult.similarity;

    }else{

        // not match

    }

}
```

This API compares 2 Bione/ISO/ANSI/ compliance features (supports cross compare) and outputs their similarities. SecurityLevel has 5 ranks ranging from level 1 to 5, with level 5 being the most secure. The recommend setting is level 4.

We have run strict tests inside Aratek using a huge database sample, and the following are the SDK performance results:

**Aratek TrustFingrt SDK provides 5 security levels. The relationship with Matching threshold, FAR and security levels is as in below table:**



Level	FAR(False accept ratio)	Threshold
1	1%	24
2	0.5%	30
3	0.1%	36
<b>4</b>	<b>0.01%</b>	<b>48</b>
5	0.001%	60

## 4 API Description

### 4.1 Class TrustFinger

#### 4.1.1 getInstance(Context context)

##### Signature

Method	public static TrustFinger getInstance(Context context)
--------	--

##### Description

Get single instance of TrustFinger class.

##### Parameter

Parameter	Description
<i>context</i>	the context for the receiver and USB accesses

##### Return

Single instance of TrustFinger.

#### 4.1.2 initialize()

##### Signature

Method	public void initialize() throws TrustFingerException
--------	--

##### Description

Initialize the SDK running environment, normally call this API in application process, and only need to call once before releasing the device.

#### 4.1.3 release()

**Signature**

Method	public void release()
--------	-----------------------

**Description**

Release the resources applied by initialize.

**4.1.4     getDeviceCount()****Signature**

Method	public int getDeviceCount() throws TrustFingerException
--------	---

**Description**

Counts the number of connected Aratek fingerprint readers. Only the attached devices to which the caller has been granted permission will be counted.

**Return**

Number of Aratek fingerprint readers counted.

**4.1.5     openDevice(int, DeviceOpenListener)****Signature**

Method	public void openDevice(final int deviceIndex, DeviceOpenListener deviceOpenListener) throws TrustFingerException
--------	--

**Description**

Initialize device asynchronously, given a particular device index. This function returns immediately, and does not wait whether the APK has access permission or not. If the APK does not have access permission, it will request for one, but it terminates immediately after the request. The parameter DeviceOpenListener will receive [openSuccess\(\)](#) invoked with a device object. When an error occurs, [openFail\(\)](#) will be invoked with the error message that occurred.

**Parameter**

Parameter	Description
<i>deviceIndex</i>	zero-based index of the device
<i>deviceOpenListener</i>	Call back function once opened the device (See Interface <a href="#">DeviceOpenListener</a> )

#### 4.1.6 getSdkVersion()

##### Signature

Method	public native String getSdkVersion()
--------	--------------------------------------

##### Description

Obtains the SDK version information.

##### Return

SDK Version.

#### 4.1.7 getDeviceList()

##### Signature

Method	Public List<String> getDeviceList()
--------	-------------------------------------

##### Description

Get a list of connected devices.

##### Return

A list of device.

#### 4.1.8 setDeviceListener(DeviceListener)

##### Signature

Method	Public void setDeviceListener(DeviceListener deviceListener)
--------	--

##### Description

Set up a listener for plugging and unplugging device. When a device is plugged in, the parameter DeviceListener will receive [deviceAttached\(\)](#) invoked with a new list of device, When a device is unplugged, the parameter DeviceListener will receive [deviceDetached\(\)](#) invoked with a new list of device.

**Parameter**

Parameter	Description
<i>deviceListener</i>	Call back function (See Interface <a href="#">DeviceListener</a> )

## 4.2 Class TrustFingerDevice

### 4.2.1 getImageInfo ()

**Signature**

Method	public ScannerImageInfo getImageInfo()
--------	--

**Description**

Get width, height, and resolution info about the image captured from the present reader.

**Return**

Image info of the device. (See Class [ScannerImageInfo](#))

### 4.2.2 getDeviceDescription()

**Signature**

Method	public DeviceDescription getDeviceDescription()
--------	---

**Description**

Retrieve detailed device information about particular scanner.

**Return**

A description of the device. (See Class [DeviceDescription](#))

### 4.2.3 captureRawData()

**Signature**

Method	public byte[] captureRawData() throws TrustFingerException
--------	--

**Description**

Collect raw image data from fingerprint reader.

**Return**

Raw image data.

### 4.2.4 captureRawData(long)

**Signature**

Method	public byte[] captureRawData(long timeout) throws TrustFingerException
--------	--

**Description**

Collect raw image data from fingerprint reader.

**Parameter**

Parameter	Description
timeout	Timeout

**Return**

Raw image data.

### 4.2.5 captureRawDataLfd(int[])

**Signature**

Method	public byte[] captureRawDataLfd(int[] lfdstatus) throws TrustFingerException
--------	--

**Description**

Collect raw image data from fingerprint reader with LFD.

**Parameter**

Parameter	Description
<i>lfdstatus</i>	The finger status.( See Enumeration <a href="#">LfdStatus</a> )

**Return**

Raw image data.

#### 4.2.6 captureBmpData()

**Signature**

Method	Public byte[] captureBmpData() throws TrustFingerException
--------	--

**Description**

Capture a frame with bmp format

**Return**

Bmp format image

#### 4.2.7 captureBmpDataLfd(int[])

**Signature**

Method	public byte[] captureBmpDataLfd(int[] lfdstatus) throws TrustFingerException
--------	--

**Description**

Collect a bmp image data from fingerprint reader with LFD.

**Parameter**

Parameter	Description
<i>lfdstatus</i>	The finger status.( See Enumeration <a href="#">LfdStatus</a> )

**Return**

Bmp format image.

**4.2.8 captureISOData(FingerPosition, ImgCompressAlg)****Signature**

Method	public byte[] captureISOData(FingerPosition fingerPosition, ImgCompressAlg imgCompressAlg) throws TrustFingerException
--------	--

**Description**

Collect one image frame using specified ISO standard format.

**Parameter**

Parameter	Description
<i>fingerPosition</i>	Finger position (See Enumeration <a href="#">FingerPosition</a> )
<i>ImgCompressAlg</i>	Algorithm about compression: (See Enumeration <a href="#">ImgCompressAlg</a> )  UnCompressed = 0  BitPacked = 1  WSQ = 2  JPEG = 3  JPEG2000 = 4  PNG = 5

**Return**

ISO format image.

**4.2.9 captureISODataLfd(FingerPosition, ImgCompressAlg,int[])****Signature**

Method	public byte[] captureISODataLfd(FingerPosition fingerPosition, ImgCompressAlg imgCompressAlg,int[] lfdStatus) throws
--------	--



	TrustFingerException
--	----------------------

**Description**

Collect one image frame using specified ISO standard format with LFD.

**Parameter**

Parameter	Description
<i>fingerPosition</i>	Finger position (See Enumeration <a href="#">FingerPosition</a> )
<i>ImgCompressAlg</i>	Algorithm about compression: (See Enumeration <a href="#">ImgCompressAlg</a> )  UnCompressed = 0  BitPacked = 1  WSQ = 2  JPEG = 3  JPEG2000 = 4  PNG = 5
<i>lfdStatus</i>	The finger status.( See Enumeration <a href="#">LfdStatus</a> )

**Return**

ISO format image.

**4.2.10 captureANSIData(FingerPosition, ImgCompressAlg)****Signature**

Method	public byte[] captureANSIData(FingerPosition fingerPosition, ImgCompressAlg imgCompressAlg) throws TrustFingerException
--------	---

**Description**

Collect an ANSI format image.

**Parameter**

Parameter	Description
-----------	-------------

<i>fingerPosition</i>	Finger position index(See Enumeration <a href="#">FingerPosition</a> )
<i>Imgcompressalg</i>	Compression algorithm: (See Enumeration <a href="#">ImgCompressAlg</a> )  UnCompressed = 0  BitPacked = 1  WSQ = 2  JPEG = 3  JPEG2000 = 4  PNG = 5

**Return**

ANSI format fingerprint data.

#### 4.2.11 captureANSIDataLfd(FingerPosition, ImgCompressAlg,int[])

**Signature**

Method	<pre>public byte[] captureANSIDataLfd(FingerPosition fingerPosition,     ImgCompressAlg imgCompressAlg, int[] lfdStatus) throws     TrustFingerException</pre>
--------	--

**Description**

Collect an ANSI format image with LFD.

**Parameter**

Parameter	Description
<i>fingerPosition</i>	Finger position index(See Enumeration <a href="#">FingerPosition</a> )
<i>Imgcompressalg</i>	Compression algorithm: (See Enumeration <a href="#">ImgCompressAlg</a> )  UnCompressed = 0  BitPacked = 1  WSQ = 2  JPEG = 3

	JPEG2000 = 4  PNG = 5
<i>lfdStatus</i>	The finger status.( See Enumeration <a href="#">LfdStatus</a> )

**Return**

ANSI format fingerprint data.

#### 4.2.12 captureWSQData()

**Signature**

Method	public byte[] captureWSQData() throws TrustFingerException
--------	--

**Description**

Collect a WSQ format image.

**Return**

WSQ format image.

#### 4.2.13 captureWSQDataLfd(int[])

**Signature**

Method	public byte[] captureWSQDataLfd(int[] lfdStatus) throws TrustFingerException
--------	--

**Description**

Collect a WSQ format image with LFD.

**Parameter**

Parameter	Description
<i>lfdStatus</i>	The finger status.( See Enumeration <a href="#">LfdStatus</a> )

**Return**

WSQ format fingerprint data.

#### 4.2.14 getLedStatus(LedIndex)

##### Signature

Method	public LedStatus getLedStatus(LedIndex ledIndex) throws TrustFingerException
--------	--

##### Description

Get LED status. (This function currently only supports A600 reader)

##### Parameter

Parameter	Description
ledIndex	LED Index(See Enumeration <a href="#">LedIndex</a> )

##### Return

Status about specified LED. (See Enumeration [LedStatus](#))

#### 4.2.15 setLedStatus(LedIndex, LedStatus)

##### Signature

Method	public int setLedStatus(LedIndex ledIndex, LedStatus ledStatus) throws TrustFingerException
--------	--

##### Description

Set LED status.

##### Parameter

Parameter	Description
ledIndex	LED index(See Enumeration <a href="#">LedIndex</a> )
ledStatus	LED status (See Enumeration <a href="#">LedStatus</a> )

**Return**

Return code	Description
0	Succeed to set the LED status
Others	Failed to set the LED status

**4.2.16 extractFeature(byte[], FingerPosition)****Signature**

Method	public byte[] extractFeature(byte[] rawData, FingerPosition fingerPosition)
--------	---

**Description**

Extract feature data from raw image.

**Parameter**

Parameter	Description
<i>rawData</i>	Image raw data
<i>fingerPosition</i>	Finger position index(See Enumeration <a href="#">FingerPosition</a> )

**Return**

ARATEK Bione® Format fingerprint feature data.

**4.2.17 extractANSIFeature(byte[], FingerPosition)****Signature**

Method	public byte[] extractANSIFeature(byte[] rawData, FingerPosition fingerPosition)
--------	---

**Description**

Extract ANSI standard fingerprint feature from raw image.

**Parameter**

Parameter	Description
<i>rawData</i>	Image raw data
<i>fingerPosition</i>	Finger position index(See Enumeration <a href="#">FingerPosition</a> )

**Return**

ANSI format fingerprint feature data.

#### 4.2.18 extractISOFeature(byte[], FingerPosition)

**Signature**

Method	public byte[] extractISOFeature(byte[] rawData, FingerPosition fingerPosition) throws TrustFingerException
--------	--

**Description**

Extract ISO standard fingerprint feature from raw image.

**Parameter**

Parameter	Description
<i>rawData</i>	Image raw data
<i>fingerPosition</i>	Finger position index(See Enumeration <a href="#">FingerPosition</a> )

**Return**

ISO format feature data.

#### 4.2.19 generalizeTemplate(byte[], byte[], byte[])

**Signature**

Method	public byte[] generalizeTemplate(byte[] featureData1, byte[] featureData2, byte[] featureData3) throws TrustFingerException
--------	---

**Description**

Combine 3 features into one template.

**Parameter**

Parameter	Description
<i>featureData1</i>	Fingerprint feature data
<i>featureData2</i>	Fingerprint feature data
<i>featureData3</i>	Fingerprint feature data

**Return**

Fingerprint template data.

**4.2.20 verify(SecurityLevel, byte[], byte[])****Signature**

Method	<pre>public VerifyResult verify(SecurityLevel securityLevel, byte[] featureData1, byte[] featureData2)</pre>
--------	--

**Description**

Verify one feature from another (from database). This API has 4 parameters, securityLevel: 1 to 5, with 5 being the most secure; the default setting is 4. The other 2 parameters are template entrance, the format shall be ARATEK Bione<sup>®</sup>, ANSI or ISO.

If the value of VerifyResult.error is 0, it means no error has occurred, so you can get the similarity value and check if they are matched. Otherwise it means an error occurred and you cannot get similarity or match results.

**Aratek TrustFingrt SDK provides 5 security levels. The relationship with Matching threshold, FAR and security levels is as in below table:**

Level	FAR(False accept ratio)	Threshold
1	1%	24
2	0.5%	30
3	0.1%	36

4	0.01%	48
5	0.001%	60

**Parameter**

Parameter	Description
<i>securityLevel</i>	Security Level, has five levels: 1 to 5. Higher, safer. Recommend to use level 4. (See Enumeration <a href="#">SecurityLevel</a> )
<i>featureData1</i>	Fingerprint feature data
<i>featureData2</i>	Fingerprint feature data

**Return**

Verify result. (See Class [VerifyResult](#))

**4.2.21 rawToBmp(byte[], int, int, int)****Signature**

Method	public byte[] rawToBmp(byte[] rawData, int imageWidth, int imageHeight, int imageResolution)
--------	--

**Description**

Convert RAW image to BMP.

**Parameter**

Parameter	Description
<i>rawData</i>	Fingerprint raw image data
<i>imageWidth</i>	Image width
<i>imageHeight</i>	Image height
<i>imageResolution</i>	Image resolution

**Return**

BMP format image.



#### 4.2.22 bmpToRaw(byte[])

**Signature**

Method	public byte[] bmpToRaw(byte[] bmpData)
--------	--

**Description**

Convert BMP image to raw image.

**Parameter**

Parameter	Description
<i>bmpData</i>	Bitmap data, with BMP header

**Return**

RAW Fingerprint image data.

#### 4.2.23 rawToWsqa(byte[], int, int, int)

**Signature**

Method	public byte[] rawToWsqa(byte[] rawData, int imageWidth, int imageHeight, int imageResolution)
--------	---

**Description**

Convert RAW fingerprint image data to WSQ format.

**Parameter**

Parameter	Description
<i>rawData</i>	Raw image data
<i>imageWidth</i>	Image width
<i>imageHeight</i>	Image height
<i>imageResolution</i>	Resolution

**Return**

WSQ format image data.

#### 4.2.24 rawToANSI(byte[], int, int, int, int)

##### Signature

Method	public byte[] rawToWsqr(byte[] rawData, int imageWidth, int imageHeight, int imageResolution, FingerprintPosition fingerprintPosition, ImgCompressAlg imgCompressAlg)
--------	---

##### Description

Convert RAW image to ANSI format.

##### Parameter

Parameter	Description
<i>rawData</i>	Raw image data
<i>imageWidth</i>	Image width
<i>imageHeight</i>	Image height
<i>imageResolution</i>	Image resolution
<i>fingerprintPosition</i>	Fingerprint position index (See Enumeration <a href="#">FingerPosition</a> )
<i>imgCompressAlg</i>	Compression algorithm: (See Enumeration <a href="#">ImgCompressAlg</a> )  UnCompressed = 0  BitPacked = 1  WSQ = 2  JPEG = 3  JPEG2000 = 4  PNG = 5

##### Return

ANSI format fingerprint image data.

#### 4.2.25 rawToISO(byte[], int, int, int, int, int)

##### Signature

Method	public byte[] rawToISO(byte[] rawData, int imageWidth, int imageHeight, int imageResolution, int fingerprintPosition, int imgCompressAlg)
--------	---

##### Description

Convert RAW image to ISO format image.

##### Parameter

Parameter	Description
<i>rawData</i>	Raw image data
<i>imageWidth</i>	Image width
<i>imageHeight</i>	Image height
<i>imageResolution</i>	Image resolution
<i>fingerprintPosition</i>	Finger position index
<i>imgCompressAlg</i>	Compression algorithm

##### Retrun

ISO format image data

#### 4.2.26 rawDataQuality (byte[])

##### Signature

Method	public int rawDataQuality(byte[] rawData) throws TrustFingerException
--------	---

##### Description

Get raw image quality. The output score is in a range from 0 to 100; higher score means

better image quality.

#### Parameter

Parameter	Description
<i>rawData</i>	Raw image data

#### Return

Fingerprint image quality.

### 4.2.27 bmpDataQuality(byte[])

#### Signature

Method	<code>public int bmpDataQuality(byte[] bmpData) throws TrustFingerException</code>
--------	--

#### Description

Get BMP image quality. The output score is in a range from 0 to 100; higher score means better image quality.

#### Parameter

Parameter	Description
<i>bmpData</i>	BMP image data

#### Return

Fingerprint image quality.

### 4.2.28 close()

#### Signature

Method	<code>public void close() throws TrustFingerException</code>
--------	--

#### Description

Close fingerprint reader.

#### 4.2.29 setLFDLevel(int)

##### Signature

Method	public void setLFDLevel(int level)
--------	------------------------------------

##### Description

Set LFD level.(Only supported by A600)

##### Parameter

Parameter	Description
<i>level</i>	LFD level(See Enumeration <a href="#">LfdLevel</a> )

#### 4.2.30 getLFDLevel ()

##### Signature

Method	public int getLFDLevel()
--------	--------------------------

##### Description

Get LFD level. (Only supported by A600)

##### Return

LFD level. (See Enumeration [LfdLevel](#))

### 4.3 Class VerifyResult

If the value of VerifyResult.error is 0, it means no error has occurred, so you can get the similarity value and check if they are matched. Otherwise it means an error occurred and you cannot get similarity or match results.

Attribute	Description
<i>int error</i>	Error code. 0 means successful, others means error code

<i>int similarity</i>	Similarity
<i>boolean isMatched</i>	Whether is matched

#### 4.4 Class ScannerImageInfo

Attribute	Description
<i>int width</i>	Width
<i>int height</i>	Height
<i>int resolution</i>	Resolution

#### 4.5 Class DeviceDescription

Attribute	Description
<i>String infoVersion</i>	Device version info
<i>String manufacturer</i>	Manufacture
<i>String productName</i>	Product name
<i>String productModel</i>	Product module
<i>String hwVersion</i>	Hardware version
<i>String bootVersion</i>	Bootloader version
<i>String fwVersion</i>	Firmware version
<i>String serialNumber</i>	Device serial number
<i>int imageWidth</i>	Image width
<i>int imageHeight</i>	Image height
<i>String productionDate</i>	Produced date and time
<i>int deviceId</i>	Device ID
<i>int resolution</i>	Fingerprint reader resolution
<i>boolean isUSBSupported</i>	Whether supports USB
<i>boolean isUARTSupported</i>	Whether supports UART
<i>boolean isSPISupported</i>	Whether supports SPI

## 4.6 Interface DeviceOpenListener

### 4.6.1 openSuccess(TrustFingerDevice)

#### Signature

Method	void openSuccess(TrustFingerDevice trustFingerDevice)
--------	---

#### Description

Method when a request to open a device is successful

#### Parameter

Parameter	Description
trustFingerDevice	Device object(See Class <a href="#">TrustFingerDevice</a> )

### 4.6.2 openFail(String)

#### Signature

Method	void openFail(String errorMessage)
--------	------------------------------------

#### Description

Method when a request to open a device has failed

#### Parameters

Parameter	Description
errorMessage	Error message

## 4.7 Interface DeviceListener

### 4.7.1 deviceAttached(List<String>)

#### Signature

Method	void deviceAttached(List<String> mDevices)
--------	--

**Description**

Method when a device is plugged in.

**Parameter**

Parameter	Description
<i>mDevices</i>	A list of devices.

## 4.7.2 deviceDetached(List<String>)

**Signature**

Method	void deviceDetached(List<String> mDevices)
--------	--

**Description**

Method when a device is unplugged.

**Parameters**

Parameter	Description
<i>mDevices</i>	A list of devices.

## 4.8 Enumeration ImgComCompressAlg

Enumeration	Description
UNCOMPRESSED_NO_BIT_PACKING	Uncompressed – no bit packing
UNCOMPRESSED_BIT_PACKED	Uncompressed – bit packed
COMPRESSED_WSQ	Compressed – WSQ
COMPRESSED_JPEG	Compressed – JPEG
COMPRESSED_JPEG2000	Compressed – JPEG2000
PNG	png



## 4.9 Enumeration LedIndex

Enumeration	Description
RED	Red LED
GREEN	Green LED

## 4.10 Enumeration LedStatus

Enumeration	Description
OPEN	Open
CLOSE	Close

## 4.11 Enumeration SecurityLevel

Enumeration	Description
Level5	Level 5
Level4	Level 4
Level3	Level 3
Level2	Level 2
Level1	Level 1

## 4.12 Enumeration LfdLevel

Enumeration	Description
OFF	Value is 0.
EXTRA_LOW	Value is 1.
LOW	Value is 2.
MEDIUM	Value is 3.
HIGH	Value is 4.
ULTRA_HIGH	Value is 5.

## 4.13 Enumeration LfdStatus

Enumeration	Description
UNKOWN	Unkown Finger
NORMAL	Normal Finger
FAKE	Fake Finger

## 4.14 Enumeration FingerPosition

Enumeration	Description
RightThumb	Right thumb
RightIndexFinger	Right index finger
RightMiddleFinger	Right middle finger
RightRingFinger	Right ring finger
RightLittleFinger	Right little finger
LeftThumb	Left thumb
LeftIndexFinger	Left index finger
LeftMiddleFinger	Left middle finger
LeftRingFinger	Left ring finger
LeftLittleFinger	Left little finger
Unknown	Unknown position

## 4.15 Enumeration TrustFingerException.Type







Enumeration	Description
SUCCESS	Success
FAIL	Fail
DEVICE_NOT_FOUND	Cannot find device
DEVICE_NOT_AUTHORIZED	Device is not authenticated

<b>DEVICE_NOT_INITIALIZED</b>	Device is not initialized
<b>DEVICE_NOT_CONNECTED</b>	Device is not connected
<b>DEVICE_NOT_OPENED</b>	Cannot open device
<b>DEVICE_GET_INTERFACE_FAIL</b>	Failed to get device interface
<b>DEVICE_GET_ENDPOINT_FAIL</b>	Failed to get (usb) endpoint
<b>DEVICE_GET_CONNECTION_FAIL</b>	Failed to connect to device
<b>DEVICE_NO_USB_HOST_FEATURE</b>	Not supported USB HOST mode
<b>DEVICE_NOT_ACCESSIBLE</b>	Cannot access the device
<b>DEVICE_ALREADY_OPENED</b>	Device has already been opened
<b>DEVICE_ALREADY_CLOSED</b>	Device has already been closed
<b>API_NOT_SUPPORTED</b>	Not supported API
<b>FAKE_FINGER</b>	Fake finger
<b>CAPTURE_FAIL</b>	Failed to capture image
<b>CAPTURE_ERROR</b>	Error occurred during capture process
<b>TRANSFER_PACKET_ERROR</b>	Transaction packet error
<b>TRANSFER_READ_ERROR</b>	Read transaction error
<b>TRANSFER_WRITE_ERROR</b>	Write transaction error
<b>TRANSFER_CONTROL_ERROR</b>	Control transaction error
<b>INVALID_PARAM_VALUE</b>	Invalid parameter
<b>NOT_ENOUGH_MEMORY</b>	Memory is not enough
<b>INVALID_DEVICE_INDEX</b>	Invalid device index
<b>FP_FEATURE_CONVERT_ERROR</b>	Error occurred during feature conversion
<b>FP_BAD_IMAGE</b>	Image quality is poor
<b>FP_INVALID_DATA</b>	Invalid data
<b>INIT_ALGORITHM_ERROR</b>	Failed to initialize algorithm
<b>UNKNOW_TYPE</b>	Unknown exception
<b>GENERALIZE_TEMPLATE_FAIL_NOT_SAME_FINGER</b>	The three features used to generalize

	aren't from the same finger
UNKNOWN_ERROR	Unknown error

## 5 Appendix

### 5.1 Supported Device List

Picture	Module	Description
	A400	Capacitive fingerprint reader
	A600	Optical fingerprint reader
	FRT610	Capacitive fingerprint reader
	EM03-3011	Capacitive fingerprint reader module
	EM-4010	Capacitive fingerprint reader module
	EM4010	Capacitive fingerprint reader module
	A700	Optical fingerprint reader

