U.are.U SDK
Version 2
Platform Guide for Windows CE
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This manual describes how to use the U.are.U SDK to develop applications for devices based on Microsoft Windows CE. The U.are.U SDK is available for multiple platforms and this document describes issues specific to developing applications for devices based on Microsoft Windows CE.

Chapter 1, *Introduction* (this chapter) describes how to get the latest version of this document.

Chapter 2, *Installation* provides instructions for installing on your development system and on the Windows CE target reader.

Chapter 3, *Developing Applications with C/C++* lists system requirements for developing and running applications in C/C++ and describes the C/C++ sample application.

Chapter 4, *Developing Applications with .NET* lists system requirements for developing and running applications with .NET and describes the .NET sample applications for VB.NET and C#.

For a detailed description of the SDK, consult the U.are.U SDK Developer Guide which was included with your download, or check online at


Getting Updated Documentation

If you are viewing this guide from the download package for the U.are.U SDK, you may want to check online at our website for an updated version of this document at

Except as noted in the platform/language-specific chapters, the installation process is the same for all Windows CE development.

Installing on the Development and Target Systems

There are two steps to the installation:

1. Installing on the development system
2. Installing on the CE device (the target hardware)

These steps are described below. Note that the same distribution file is used for installing on both development and test/target systems -- during installation, different files are copied to the product folder depending on how you install.

Step 1: Installing on the Development System (SDK Installation)

To install the SDK on your development system:

1. Unzip the distribution file into a folder.
2. Open the CE5 or CE6 folder.
3. Open the Runtime Install folder.
4. Open the X86 folder and run Dpinstall.INTEL.CAB.
   OR
   Open the Armv4i folder and run Dpinstall.ARMV4I.CAB.

The installer copies all necessary files to the selected folder (by default, the product folder is Program Files\DigitalPersona\U.are.U CE SDK ). The files installed on the developer’s machine are located in the following folders within the main product folder:

<table>
<thead>
<tr>
<th>Folder</th>
<th>Contents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Include</td>
<td>Header files for C/C++ API.</td>
</tr>
<tr>
<td>WindowsCE\Docs</td>
<td>End user license agreement (EULA) plus documentation:</td>
</tr>
<tr>
<td></td>
<td>- SDK Developer Guide - describes all APIs</td>
</tr>
<tr>
<td></td>
<td>- Platform Guide for Windows CE - Windows CE-specific details</td>
</tr>
<tr>
<td></td>
<td>- C_API - Doxygen for C/C++ API</td>
</tr>
<tr>
<td></td>
<td>- .NET_ActiveX_API - Doxygen for .NET API and controls</td>
</tr>
</tbody>
</table>
Step 2: Installing on the Target Hardware (RTE Installation)

To install the run-time environment on the target hardware platform:

1. Unzip the distribution file into a folder.
2. Open the CE5 or CE6 folder, corresponding to the version of CE that you are running on the target hardware.
3. Open the Runtime Install folder.
4. Open the ARMV4I or X86 folder corresponding to the processor on the target hardware.
5. If you are using ActiveSync, connect ActiveSync between the host PC and the target hardware and run Setup.exe. If you are NOT using ActiveSync, copy the .cab file and run it on the target hardware.
6. Follow the onscreen instructions to complete setup.
7. Plug the supported Fingerprint Reader into the USB port of the target hardware.
The installer copies drivers, the SDK layer and compiled binary files for sample applications to the selected folder (by default, the files are copied to \WindowsCE, but the files can be in another other place, depending on your installation choices).

**Uninstalling**

If you need to uninstall the SDK or RTE, use the Control Panel.
Pre-Requisites

This chapter assumes that you have a working knowledge of C/C++ and that you know how to develop for Windows CE devices.

System Requirements

Development System

- Windows XP Professional or higher
- VisualStudio 2005 or 2008
- SDK for Microsoft Windows CE 5.0 is required to build the sample application provided with this SDK

Target Runtime Hardware (CE Device)

The Windows CE-based device that will run the application must be one of the following hardware platforms:

- Intel x86 architecture with CPU from 600MHz and at least 16MB of available RAM;
- ARMv4I with CPU from 400MHz and at least 16MB of available RAM.

The file sizes are (in KB):

<table>
<thead>
<tr>
<th></th>
<th>x86</th>
<th>ARMv4I</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capture runtime (drivers + SDK layer)</td>
<td>160</td>
<td>245</td>
</tr>
<tr>
<td>Fingerprint recognition runtime</td>
<td>90</td>
<td>144</td>
</tr>
</tbody>
</table>

In addition, the device must also have:

- a USB port
- 16 MB free memory
- Windows CE 5.0, 6.0, 6.1, 6.5

The SDK works on a variety of hardware and is intended to have a small footprint so that it can run even on minimal hardware. Less capable hardware will work, but response time may not be optimal.
The Sample Application

U.are.U SDK includes a sample application to demonstrate the features of the SDK. The sample application is located in the Samples folder. The source file is Samples/WinMain.cpp and the compiled file, UareUSample.exe can be downloaded to your CE device for testing. Depending on your version of Visual Studio, you can use UareUSample2005.vcproj or UareUSample2008.vcproj.

The application demonstrates the features of the SDK. When you launch the application, you see the main screen as shown below.

Selecting a Reader

Click on Reader Selection to open a device. All available devices will be displayed, as shown on the screen below.
Clicking on the Get reader capabilities button will display additional information about the selected reader, as shown below.

Click OK to return to the previous screen. Click OK to select the device. At the point, you are returned to the main screen and all of the buttons are enabled.

**Testing Capture Mode**

Click on the Capture button to put the device into capture mode and you can press your finger onto the reader to capture a fingerprint and display it on the screen as shown below.

Click on the Back button to return to the main screen.
Testing Streaming Mode

Click on the **Streaming** button to put the device into streaming mode. Then press your finger onto the reader to capture a fingerprint stream and display it on the screen as shown below.

 ![Streaming](image)

Click on the **Back** button to return to the main screen.

Verifying Fingerprints

Click on the **Verification** button next. You will be prompted to put your finger onto the reader. Then you can put a second finger on the reader. If you use the same finger, you will see a message that the fingerprints matched, as shown below.

 ![Verification](image)

When you click on **Back** you will return to the main screen.
Identifying Fingerprints

Click on Identification to test the next component of the sample program. You will be prompted to provide a thumbprint, index finger, etc. Then you will be prompted to provide another finger and you will receive a message indicating if there was a match and which finger was detected, as shown in the image below.

![Identification dialog box]

Enrolling Fingerprints

Next, click on the Enrollment button from the main screen.

![Enrollment dialog box]

This feature simply captures a fingerprint, creates a FMD, and displays a message on the screen to confirm that it was successful.

Note that if you unplug the device, you will receive an error message and the associated error code.
Pre-Requisites

This chapter assumes that you have a working knowledge of .NET and that you know how to develop for Windows CE devices. You must also have tools and knowledge for your target language, typically C# or Visual Basic .NET(VB.NET).

System Requirements

Development System

- Microsoft Windows XP Professional or higher, 32-bit or 64-bit
- Microsoft Visual Studio 2008
- .NET Compact Framework 3.5

Target Runtime Hardware (Windows CE Device)

The Windows CE device that will run the application must be one of the following hardware platforms:
- Intel x86 architecture with CPU speed of at least 600MHz and at least 8MB of available RAM.
- ARMv4I with CPU from 400MHz and at least 16MB of available RAM.

If GUI controls are to be used then at least 32 MB of available RAM is required for each running control instance.

The approximate file sizes are (in KB):

<table>
<thead>
<tr>
<th></th>
<th>x86</th>
<th>ARMv4I</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capture runtime (drivers + SDK layer) with fingerprint recognition</td>
<td>37</td>
<td>39</td>
</tr>
<tr>
<td>Enrollment and identification controls</td>
<td>117</td>
<td>119</td>
</tr>
</tbody>
</table>

In addition, the device must also have:
- a USB port

The SDK works on a variety of hardware and is intended to have a small footprint so that it can run even on minimal hardware. Less capable hardware will work, but response time may not be optimal.
The .NET Sample Application

U.are.U SDK includes .NET sample applications that demonstrate the features of the SDK.

- The C# sample application is located in the Samples/UareUSampleCSharp folder. The compiled file, UareUSampleCSharp.exe can be downloaded to your device for testing or you can use UareUSampleCSharp.csproj in Visual Studio.

  The Samples/UareUSampleCSharp_CaptureOnly folder contains the same C# sample application with all features removed except the capture functionality.

- The VB.NET sample application is located in the Samples/UareUSampleVBNET folder. The compiled file, UareUSampleVBNET.exe can be downloaded to your device for testing or you can use UareUSampleVBNET.vbproj in Visual Studio.

  The Samples/UareUSampleVBNET_CaptureOnly folder contains the same VB.NET sample application with all features removed except the capture functionality.

The interfaces for the VB.NET and C# sample applications are identical, except for the text on the title bar of the opening screen.

The sample application demonstrates the features of the SDK. When you launch the application, you see the main screen as shown below.

The sample program demonstrates:

- How to capture fingerprints both in scan mode and in streaming mode
- How to enroll a subject finger
- How to identify and verify a fingerprint
- The built-in control for enrollment
- The built-in control for identification
Selecting a Reader

Click on Reader Selection to open a device. All available devices will be displayed in the pull-down list, as shown on the screen below.

![Select Reader](image)

If you choose a reader from the list and click on the Capabilities button the application will display additional information about the selected reader, as shown below.

![Capabilities](image)

Click Close to return to the previous screen. Click Select to select the device. At the point, you are returned to the main screen and all of the buttons are enabled.
Capturing a Fingerprint

Click on the **Capture** button to put the device into capture mode and you can press your finger onto the reader to capture a fingerprint and display it on the screen as shown below.

While the reader is in capture mode, you can capture repeatedly by pressing a finger to the scanner plate. Click on the **Back** button to return to the main screen.

Testing Streaming Mode

Click on the **Streaming** button from the main dialog to put the device into streaming capture mode and you can press your finger onto the reader to capture a fingerprint and display it on the screen as shown below.

While the reader is in streaming mode, you can capture repeatedly by pressing a finger to the scanner plate. Click on the **Back** button to return to the main screen.
Enrolling a Finger

Click on Enrollment to begin enrolling the first test subject.

You will be prompted to scan the first finger for enrollment, as shown below.

After that finger is successfully scanned, you will be prompted to scan a second finger. The sample application will prompt you to scan additional fingers until a sufficient number of high quality scans are complete. (The number of fingers requested will vary depending on the image scans - the enrollment functions will continue to request scans until an acceptable enrollment record has been created.)

Once the enrollment is complete, you will see confirmation that the enrollment process is finished, as shown in the screen below. In this case, four fingerprint scans were sufficient.

Note that the enrollment FMD this is created is stored in memory only and will be deleted when you click the Back button.
Identifying a Fingerprint

To test the identification feature, click on the **Identification** button. Recall that identification is a 1-to-many comparison where the application would normally search through all of the enrolled fingers to find a match. For this sample, we don’t have any enrolled fingers, so you will be prompted to provide a finger. Then you will be prompted to provide another finger and you will receive a message indicating if there was a match, as shown in the image below.

![Identification window](image)

To exit identification mode, click on the **Back** button.

Verifying a Fingerprint

To test the verification feature, click on the **Verification** button. Recall that verification is a 1-to-1 comparison where the application matches against a specified fingerprint. When you click the **Verification** button, you will be prompted to place your finger on the reader. In the screen below, we have tried to verify a finger.

![Verification window](image)

To exit identification mode, click on the **Back** button.
Testing the Enrollment UI Control

If you look at the sample code, you will see that enrollment (as described above) calls functions in the SDK. An alternate way to use the .NET SDK is to use the pre-built control for enrollment. To try out the pre-built control, click on the **Enrollment GUI** button. This will launch the control. In our sample (shown below), we have the control at the left and demo/debug info at the right side of the window.

If you click on a finger, for example the index finger of the right hand, you will be prompted to scan your finger.
As you scan your finger, you can see the events and status information on the right, as shown below.

If you click on the **Cancel** button on this window, it will cancel the enrollment of the current finger.

Once the enrollment process is complete, you will be returned to the opening screen of the enrollment process. Note that the finger you enrolled now shows in green and you can click on another finger to enroll another fingerprint.

To delete an enrolled fingerprint, click on an enrolled finger in this dialog and you will be prompted to confirm that you wish to delete the fingerprint for the finger that you clicked on.

The enrollment record created by the control is stored in memory until you exit from the sample application.

To return to the sample application, click **Close**.
Testing the Identification UI Control

If you look at the sample code, you will see that identification (as described above) calls functions in the SDK. An alternate way to use the .NET SDK is to use the pre-built control for identification. To try out the pre-built control, click on the **Identification GUI** button. This will launch the control. In our sample (shown below), we have the control at the left and demo/debug info at the right side of the window.

(Note that the identification is performed against the fingerprints enrolled through the **Enrollment GUI** feature previously. When you exit from the sample application, all enrollment records are deleted.)

If the identification succeeds, you will see the details in the status box at the right. The example below shows the result of a successful identification.

Note that if you unplug the device, you will receive an error message and the associated error code.

To exit the sample application, click on the **Close** button.
Locating the Redistributable Installation Files

When you unzip the distribution file, the unzipped collection of files includes two folders: CE5\Runtime Install and CE6\Runtime Install which contain installation files for installing applications on target hardware.

When you develop a product based on the U.are.U SDK, you need to distribute U.are.U files to the Windows CE-based device. You may redistribute the files in the Runtime Install folder pursuant to the terms of the end user license agreement (EULA), attendant to the software and located in the WindowsCE\Docs folder in the installed SDK folder. These files are designed and licensed for use with your application.

You may integrate U.are.U files in two ways:

1. Incorporate the U.are.U setup file into your installer.
2. Distribute the U.are.U CAB file.

Per the terms of the EULA, DigitalPersona grants you a non-transferable, non-exclusive, worldwide license to redistribute the files contained in the Runtime Install folders in the unzipped U.are.U RTE package directory and to incorporate these files into derivative works for sale and distribution.

Fingerprint Reader Documentation

You may redistribute the documentation included in the Redist directory of the folder containing the unzipped SDK product files to your end users pursuant to the terms of this section and of the EULA, attendant to the software and located in the WindowsCE\Docs directory in the installed SDK directory.

Hardware Warnings and Regulatory Information

If you distribute DigitalPersona U.are.U fingerprint readers to your end users, you are responsible for advising them of the warnings and regulatory information included in the Warnings and Regulatory Information.pdf file in the Redist directory of the folder containing the unzipped SDK product files. You may copy and redistribute the language, including the copyright and trademark notices, set forth in the Warnings and Regulatory Information.pdf file.

Fingerprint Reader Use and Maintenance Guide