

QuickStart Instructions

WinCE-Kit

phyCORE[®]-i.MX31

**Using Microsoft Visual Studio 2005
Software Development Tool Chain**

Note: The PHYTEC WinCE-i.MX31-Disc includes the electronic version of the English phyCORE[®]-i.MX31 Hardware Manual

Edition: September 2007

A product of a PHYTEC Technology Holding company

In this manual copyrighted products are not explicitly indicated. The absence of the trademark (™) and copyright (©) symbols does not imply that a product is not protected. Additionally, registered patents and trademarks are similarly not expressly indicated in this manual.

The information in this document has been carefully checked and is believed to be entirely reliable. However, PHYTEC Messtechnik GmbH assumes no responsibility for any inaccuracies. PHYTEC Messtechnik GmbH neither gives any guarantee nor accepts any liability whatsoever for consequential damages resulting from the use of this manual or its associated product. PHYTEC Messtechnik GmbH reserves the right to alter the information contained herein without prior notification and accepts no responsibility for any damages which might result.






Additionally, PHYTEC Messtechnik GmbH offers no guarantee nor accepts any liability for damages arising from the improper usage or improper installation of the hardware or software. PHYTEC Messtechnik GmbH further reserves the right to alter the layout and/or design of the hardware without prior notification and accepts no liability for doing so.

© Copyright 2006 PHYTEC Messtechnik GmbH, 55129 Mainz.

Rights - including those of translation, reprint, broadcast, photomechanical or similar reproduction and storage or processing in computer systems, in whole or in part - are reserved. No reproduction may be made without the explicit written consent from PHYTEC Messtechnik GmbH.

	EUROPE	NORTH AMERICA
Address:	PHYTEC Technologie Holding AG Robert-Koch-Str. 39 55129 Mainz GERMANY	PHYTEC America LLC 203 Parfitt Way SW, Suite G100 Bainbridge Island, WA 98110 USA
Ordering Information:	+49 (800) 0749832 order@phytec.de	1 (800) 278-9913 sales@phytec.com
Technical Support:	+49 (6131) 9221-31 support@phytec.de	1 (800) 278-9913 support@phytec.com
Fax:	+49 (6131) 9221-33	1 (206) 780-9135
Web Site:	http://www.phytec.de	http://www.phytec.com

2nd Edition: September 2007

1	Introduction.....	1	
1.1	Rapid Development Kit Documentation.....	1	
1.2	Professional Support Packages available.....	1	
1.3	Overview of this QuickStart Instruction.....	2	
1.4	Conventions used in this QuickStart.....	3	
1.5	System Requirements.....	4	
1.6	Microsoft Visual Studio 2005 Development Tool Chain.....	5	
2	Getting Started.....	7	
2.1	Installing Visual Studio 2005.....	7	
2.2	Installing Platform Builder.....	8	
2.3	Installing WinCE i.MX31-Kit software.....	10	
2.4	Installing Microsoft Active Sync 4.5.....	13	
2.5	Preparing the phyCORE® -i.MX31 to interface to a host-PC.....	14	
2.6	Establishing an Active Sync Connection.....	15	
2.7	Downloading Example Code with Active Sync.....	15	
2.8	Downloading Example Code with Visual Studio 2005.....	17	
3	Getting More Involved.....	21	
3.1	Creating a New Project.....	21	
3.2	Modifying the Source Code.....	24	
3.3	Building the Project.....	26	
4	Debugging.....	27	
4.1	Starting the Debugger.....	27	
4.2	Visual Studio 2005 Debug Features.....	29	
4.3	Using the Visual Studio 2005 Debug Features.....	30	
4.4	Running, Stopping and Resetting.....	31	
4.5	Changing Target Settings for the "Executable Version".....	31	
5	Building an image.....	32	
5.1	Changing an image.....	32	
5.2	Download an image.....	33	
6	Summary.....	39	
	Appendix A How to install WindowsCE on the i.MX31 Kit.....	40	50 min

1 Introduction

**5 min**

This QuickStart provides general information on the PHYTEC phyCORE[®]-i.MX31 Single Board Computer (SBC). It gives you also an overview of Microsoft's Visual Studio 2005 software development tool chain and instructions on how to run example programs on the phyCORE[®]-i.MX31, mounted on the PHYTEC phyCORE[®] Development Board i.MX31, in conjunction with Visual Studio 2005.

Please refer to the [phyCORE[®]-i.MX31 Hardware Manual](#) for specific information on such board-level features as [jumper configuration](#), [memory mapping](#) and [pin layout](#). Selecting the links on the electronic version of this document leads to the respective section of the phyCORE[®]-i.MX31 Hardware Manual.

1.1 Rapid Development Kit Documentation

This "Rapid Development Kit" (RDK) includes the following electronic documentation on the enclosed "PHYTEC WinCE-i.MX31-Disc ":

- the PHYTEC [phyCORE[®]-i.MX31 Hardware Manual](#)
- controller [User's Manuals and Data Sheets](#)
- this QuickStart Instruction with general "Rapid Development Kit" description, software installation advice and an example program, enabling quick out-of-the box start-up of the phyCORE[®]-i.MX31 in conjunction with the Microsoft Visual Studio 2005 software development tool chain

1.2 Professional Support Packages available

This Kit comes with free installation support. If you do have any questions concerning installation and setup, you are welcome to contact our support department.

For more in-depth questions, we offer a variety of custom tailored packages with different support options (e-mail, phone, direct contact to the developer) and different reaction times.

Please contact our sales team to discuss the appropriate support option if professional support beyond installation and setup is important to you.

1.3 Overview of this QuickStart Instruction

This QuickStart Instruction gives a general "Rapid Development Kit" description, as well as software installation advice and one example program enabling quick out-of-the box start-up of the phyCORE[®]-i.MX31 in conjunction with Microsoft's Visual Studio 2005. It is structured as follows:

- 1) The "Getting Started" section uses the example *HelloWorld* to demonstrate the download of user code to the target device using Visual Studio 2005 with ActiveSync.
- 2) The "Getting More Involved" section provides step-by-step instructions on how to configure and build a new WinCE image, modify the example, create and build a new project and generate and download output files to the phyCORE[®]-i.MX31 using the Microsoft tools.
- 3) The "Debugging" section demonstrates simple debug functions using Visual Studio 2005 debug environment.

In addition to the dedicated data for this Rapid Development Kit, the PHYTEC WinCE Kit CD-ROM contains supplemental information on embedded microcontroller design and development.

1.4 Conventions used in this QuickStart

The following is a list of the typographical conventions used in this book:

Italic Used for file and directory names, program and command names, command-line options, menu items, URLs, and other terms that correspond to the terms on your desktop.

Bold Used in examples to show commands or other text that should be typed literally by the user.

Pay special attention to notes set apart from the text with the following icons:



At this part you might leave the path of this QuickStart.



This is a warning. It helps you to avoid annoying problems.



You can find useful supplementary information about the topic.



At the beginning of each chapter you can find information of the time to pass the following chapter.



You have successfully passed an important part of this QuickStart.



You can find information to solve problems.

1.5 System Requirements

The use of this "Rapid Development Kit" requires:

- the PHYTEC phyCORE[®]-i.MX31
- the phyCORE[®] Development Board i.MX31 with the included DB-9 serial cable, USB A/mini-B cable and AC adapter supplying 5 VDC /min. 2A
- Windows Embedded CE6.0 (Eval version)
- the PHYTEC WinCE-i.MX31-Disc for WinCE
- an IBM-compatible host-PC (586 or higher running with WindowsXP)

For more information and example updates, please refer to the following sources:

The logo for PHYTEC, consisting of the word "PHYTEC" in a bold, stylized, sans-serif font. The letters are white with a grey gradient and a drop shadow effect.

<http://www.phytec.de>
support@phytec.de

1.6 Microsoft Visual Studio 2005 Development Tool Chain

Microsoft's Software development tools for the i.MX31 architecture aid every level of developer from the professional applications engineer to the student just learning about embedded software development.

Visual Studio 2005 is a new version of Microsoft's popular IDE that supports also embedded devices. The Platform Builder is now integrated in Visual Studio 2005. So it is now possible to customize the WinCE Image and write user applications with just one tool. Visual Studio 2005 combines project management, source code editing, program debugging, and target programming in a single, powerful environment. This QuickStart provides an overview of the most commonly used VS 2005 features including:

- Project management, device setup, and tool configuration
- Editor facilities for creating, modifying, and correcting programs
- Target debugging
- Building a new image

The VS 2005 editor offers many standard and advanced software editing features like:

- **Automatic completion** of code statements
- **Auto listing** of object members
- Detailed **Syntax Highlighting**. Colours are used in printed output.
- **Automatic indent** and **tab blocks** of code

The Visual Studio 2005 Tool chain is available from your local Microsoft dealer. There is also an evaluation version available

which is used in this Quickstart. You can use it to develop standard WinCE applications, MFC WinCE applications and .NET Applications for WinCE.



If you already have installed another version of Visual Studio 2005, you can use this one. We recommend installing the evaluation version when working with this Quickstart.

2 Getting Started



4-5 h

In this chapter you will install Rapid Development Kit software and prepare the phyCORE[®]-i.MX31, mounted on the Development Board, to interface to a host-PC. You will also learn how to download an example application from a host-PC using Visual Studio 2005.

2.1 Installing Visual Studio 2005

To install Visual Studio 2005 on your desktop PC insert the DVD labeled “Visual Studio 2005 Professional Edition” included in this kit in your DVD Rom drive. The setup should launch automatically. If not, open a windows file explorer, go to your DVD drive, change to the directory vs and start “setup.exe” manually.

The following screen appears:



Click on “Install Visual Studio 2005” and follow the instructions of the setup program.

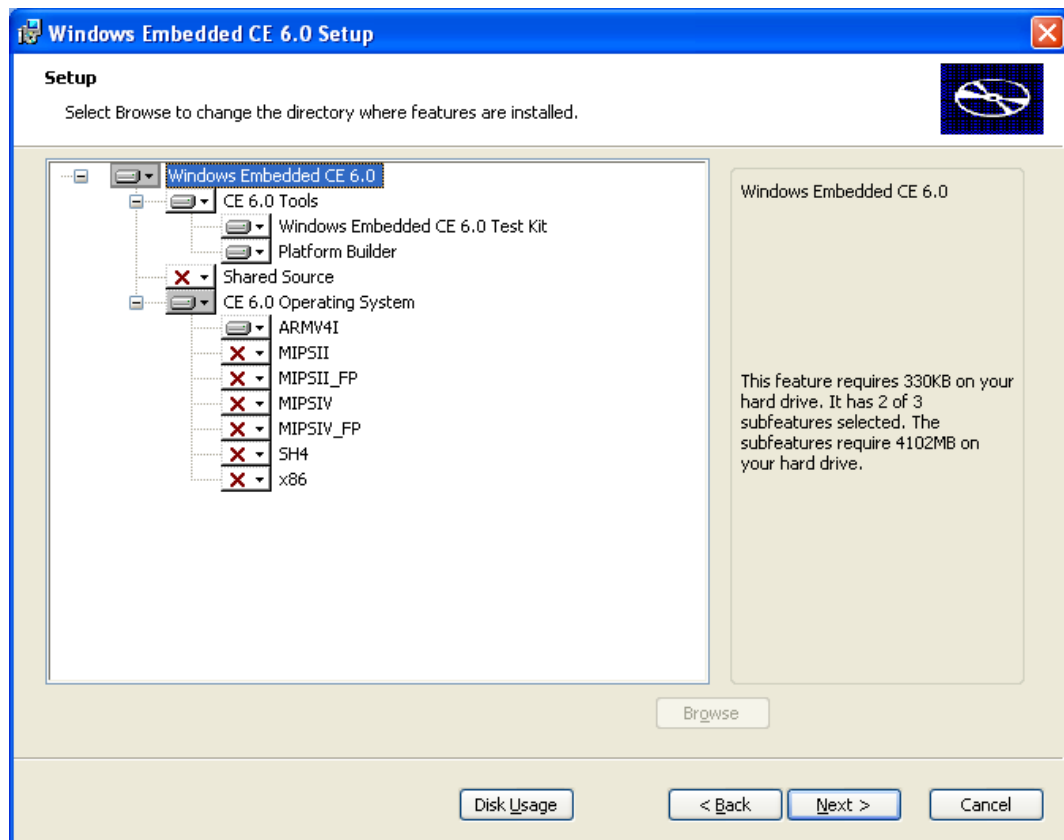


During the setup you have to enter a product activation key. You can request this key from Microsoft. Please read the inside of the Windows Embedded CE6.0 DVD package for informations.

2.2 Installing Platform Builder

To install the Platform Builder Plug-in for Visual Studio 2005, please insert the DVD labeled “Windows Embedded CE6.0” in your DVD drive. The setup should start automatically. If not, open a windows file explorer, go to your DVD drive and start “setup.exe” manually.

When the following dialog appears, be sure to select “Platform Builder” and under “CE6.0 Operating System” the files for “ARMV4I”.



During the setup you have to enter a product activation key. This key had been sent to you together with the activation key for Visual Studio 2005.

When the installation has finished, you need to install a service pack for Visual Studio 2005. Go to the following webpage <http://www.microsoft.com/downloads/details.aspx?FamilyId=BB4A75AB-E2D4-4C96-B39D-37BAF6B5B1DC&displaylang=en> and download and install the service pack.



On the download page you can choose the language of the service pack. For the Visual Studio 2005 evaluation version that comes with the PHYTEC WinCE-i.MX31-Kit, you have to download the English version.

After installing the SP1 you need to install some updates for the Platform Builder. Install the SP1 for Platform Builder from <http://www.microsoft.com/downloads/details.aspx?familyid=BF0DC0E3-8575-4860-A8E3-290ADF242678&displaylang=en>.

Also install the monthly updates starting with the rollup package from 2006 from the following site, please ensure to install the packages from ARM4I.

<http://www.microsoft.com/downloads/details.aspx?familyid=5733C26C-168B-474D-8A27-59B30B769402&displaylang=en>

At the end of this page, you can find links to all other monthly updates.

2.3 Installing WinCE i.MX31-Kit software

In this section you will find a description of the WinCE-i.MX31-Kit setup. This setup will install the following tools and programs:

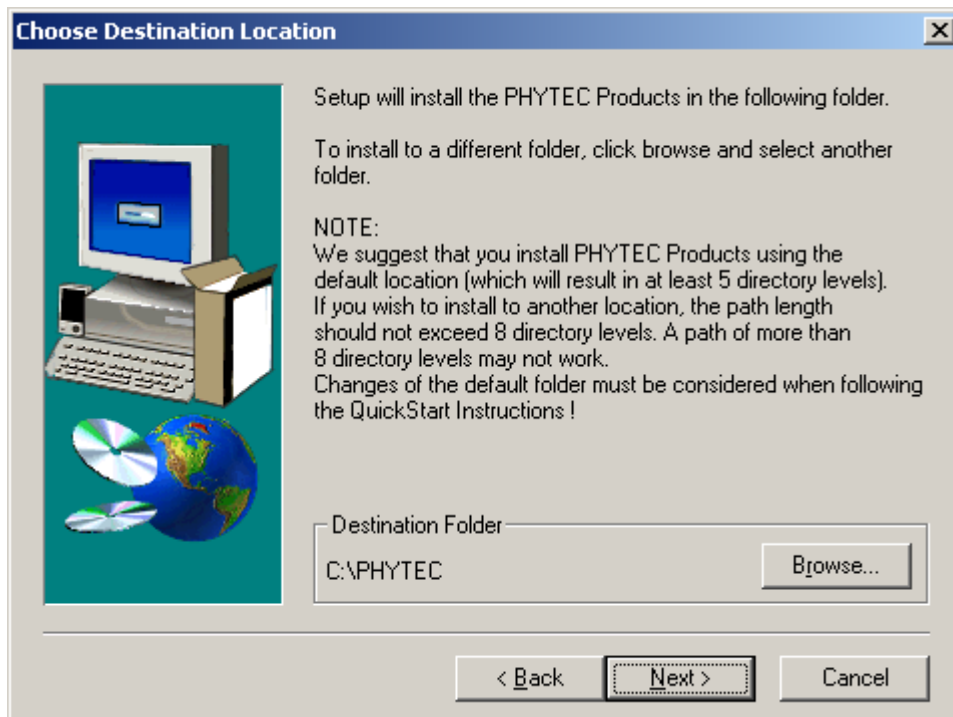
- SDK for i.MX31 WinCE6.0
- A binary BSP from Freescale for the i.MX31
- A binary BSP for the phyCORE-i.MX31 and a project to build a new image
- Example programs for Visual Studio 2005
- HabToolKit for programming a new bootloader
- Digital version of this Quickstart instruction and the hardware manuals

The i.MX31 SDK for WinCE is needed for writing target-oriented applications. It will integrate in the Visual Studio IDE, offering a new target device for code generation. Also the SDK includes all functionality that is included in the image that runs on the i.MX31. Therefore using the SDK allows the compiler to check if all functionality that is needed in the application will be present in the image. The absence of specific features is therefore recognized at “compile-time” not at “runtime”.

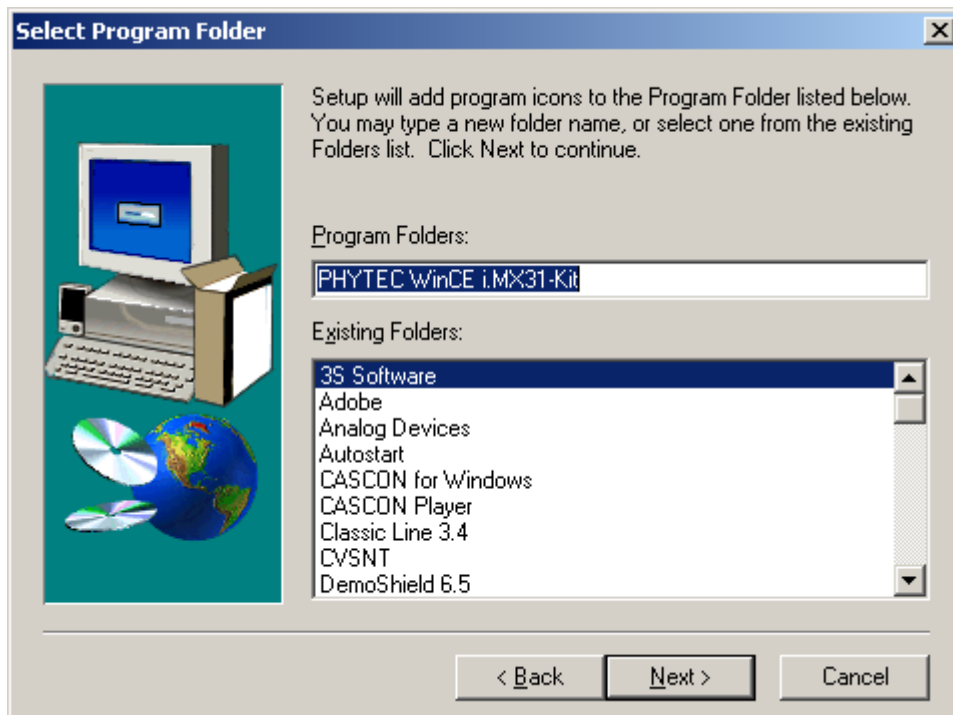


For proper installation of the SDK it is essential to first install Visual Studio 2005 as described in chapter 2.1.

Insert the CD labelled “PHYTEC WinCE-i.MX31” in your CDROM/DVD drive and start setup.exe.

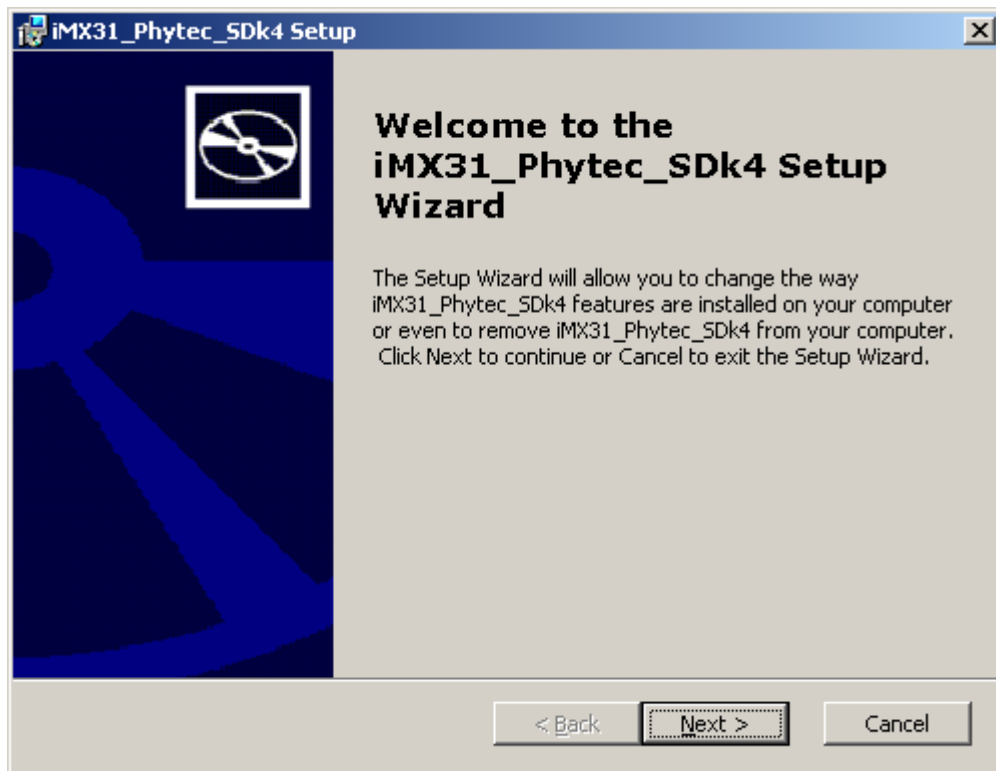


In this dialog you are asked for a destination path for installing the demo software and the manuals. We recommend to use the default path for working with this Quickstart.



In the next dialog you can choose a program folder. We recommend using the default program folder for working with this Quickstart.

In the next steps, the Freescale BSP for i.MX31 and the BSP for the PHYTEC phyCORE-i.MX31 will be installed. Please follow the instructions on the screen.



After this the installation of the SDK will be launched.
Follow the instructions of the installation program to complete the installation of the WinCE i.MX31-Kit software.

2.4 Installing Microsoft Active Sync 4.5

To be able to upload the software you are developing to your i.MX31 device you need Microsoft Active Sync 4.5. When your PC is connected to your i.MX31 device via a USB cable this software allows you to create a direct connection to your device.

You can download **Microsoft Active Sync 4.5** from the Microsoft website at <http://www.microsoft.com/windowsmobile/activesync/activesync45.mspx>

To download the software follow the instruction given on the webpage and save the downloaded file to your hard drive. Select the folder you saved the software to and double-click setup.exe.

Chose a folder and click “Next” and in the following dialog click “Install” to start the installation process for Microsoft Active Sync 4.5. This may take a few minutes.



You have successfully installed the software for the WinCE-i.MX31-Kit. You can find the programs you will need to develop own applications for the target on your host system. All necessary configurations were done by the setup program.

2.5 Preparing the phyCORE®-i.MX31 to interface to a host-PC

To be able to interface your i.MX31 with your PC you must first setup the correct network settings on your i.MX31. For downloading software to the i.MX31 with ActiveSync we will use the USB interface in this Quickstart. This chapter explains how to configure WinCE to connect to your host PC.

Connect the AC adapter with the power supply connector X30 (5V) on your board.



The power connector should have 5 VDC inside and outside should be ground.



If Windows CE didn't start within 1 minute, you have a kit with linux preinstalled. Please continue with Appendix A “How to install Windows CE on the i.MX31 Kit” and continue here after you have finished this chapter successfully.

When Windows CE has loaded it will show a screen to calibrate the touch panel. Click on the cross on the screen to calibrate your touch panel. When calibration is done you will see the WinCE screen.

2.6 Establishing an Active Sync Connection

The i.MX31 device should already be connected to the PC as described in chapter 2.4 and running.

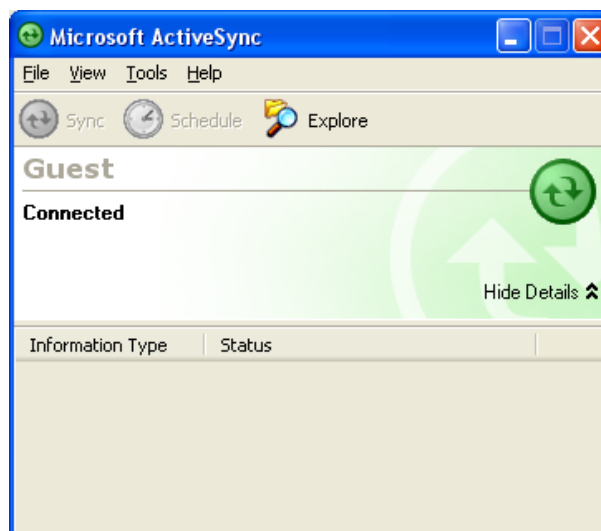
ActiveSync should already be running after the installation in chapter 2.4.

Connect the USB A/mini-B cable with the USB OTG connector (X16) on the target to a free USB port on your host.



Ensure to use the USB A/mini-B included in this RDK.

Establishing the connection might take a few seconds. Once the connection has been established Active Sync will show a screen with status information.

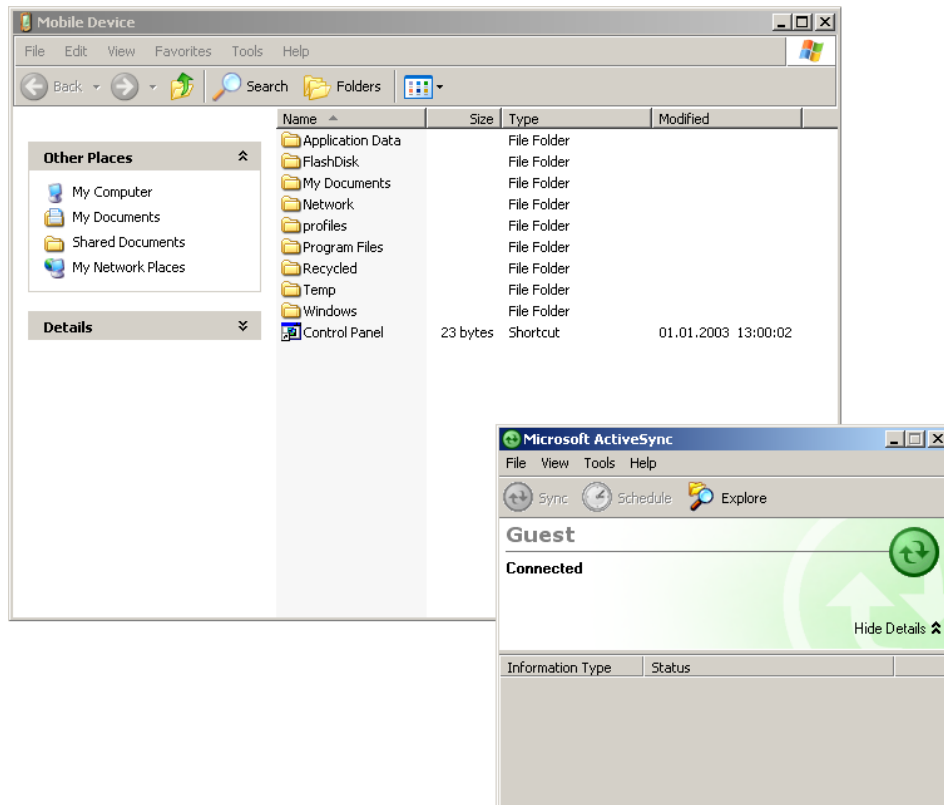


Your PC is now connected to your i.MX31 device.

2.7 Downloading Example Code with Active Sync

To download the example code provided on the WinCE-i.MX31-Disc, you need to have Active Sync running on your PC to be able to establish a connection to your i.MX31 device as described in the previous chapter.

Click on *Tools* in the menu bar of Active Sync and select *Explore Device*. An Explorer window called *Mobile Device* will open that will show you the folder structure of the Windows CE installation on your i.MX31 device.



Open a file manager and navigate to the `C:\PHYTEC\PCM037_phyCORE-i.MX31\WinCE-Kit\Demos\HelloWorld\HelloWorld\Phytec i.MX31 SDK (ARMV4I)\Debug` folder. Select `HelloWorld.exe` and copy it to the *Mobile Device* window in the folder *Program Files* using drag and drop.

The program has now been copied to your i.MX31 device. You will be able to access it by double-clicking the *My Device* icon on your i.MX31 device. This opens a window that will show you the file structure of your device. You should be able to find `HelloWorld.exe` at the location you copied it to. Double-click it to execute the program.

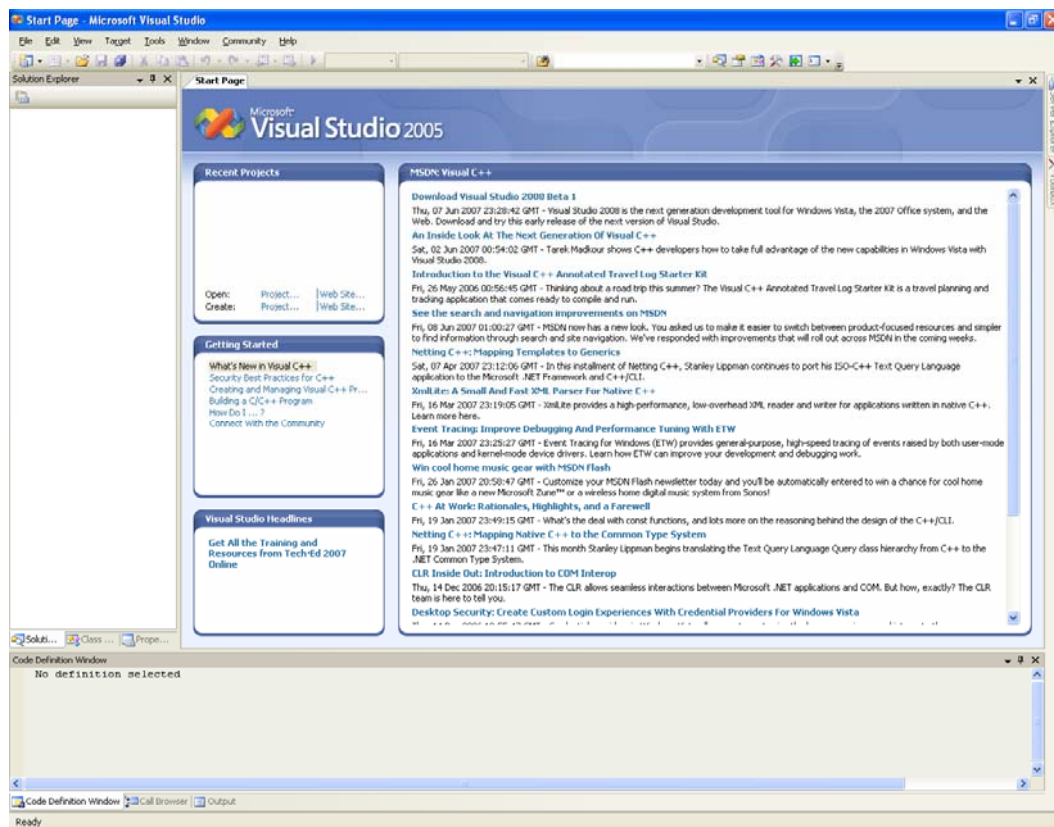
A window will open on your i.MX31 device that will print a *Hello World* message.

2.8 Downloading Example Code with Visual Studio 2005

PHYTEC provides you with example code to learn about downloading code onto your i.MX31 device. This code has already been copied to your local hard drive by the setup.

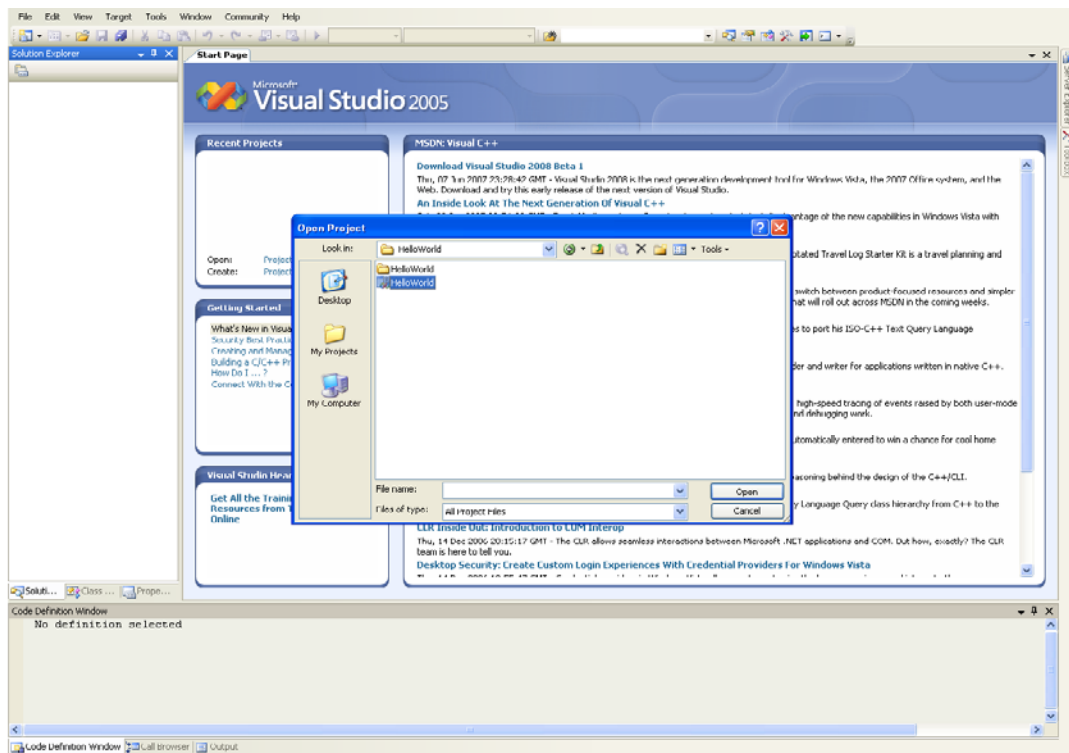
Start the tool chain by selecting *Microsoft Visual Studio 2005* from the programs group: *Start\Programs/Microsoft Visual Studio 2005*.

After starting Visual Studio 2005 the window shown below will appear. Here you can create projects, edit files, configure tools, assemble, link and start the debugger. Close all projects that might be open by selecting *Project / Close Project*.



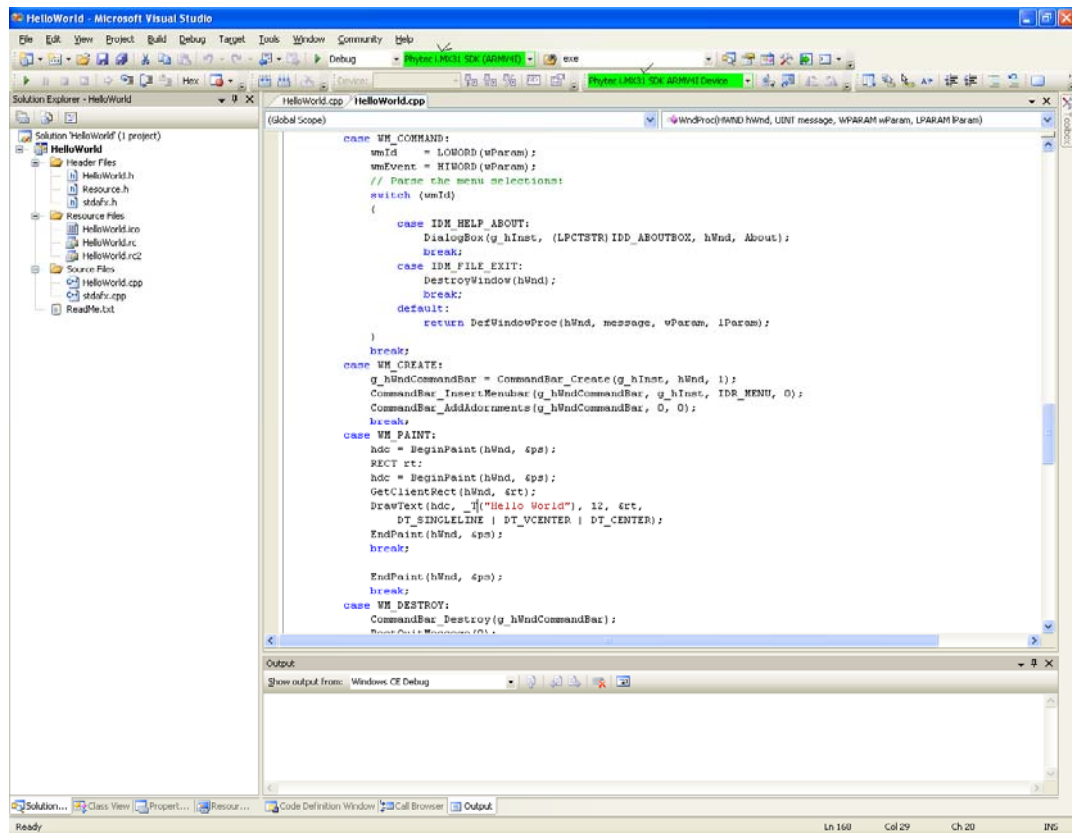
The *HelloWorld* example downloads a program to your device that, when executed, prints the text *Hello World* on the display of your phyCORE[®] Development Board i.MX31.

- To open the HelloWorld project select *File/Open/Project/Solution* from the Visual Studio 2005 menu bar.
- Browse to the folder *C:\PHYTEC\PCM037_phyCORE-i.MX31\WinCE-Kit\Demos\HelloWorld*.
- Select the HelloWorld project *HelloWorld*.




- Click *Open*.
- In the **Solution Platform** pull-down menu make sure that the *Phytec i.MX31 SDK (ARMV4I)* configuration is selected. Also make

sure that *Phytec i.MX31SDK ARMV4I* device is selected in the **Target device** menu.



If these menus are not shown in your Visual Studio IDE, move your mouse to an empty space on the toolbar, press the right mouse button and select from the pop up menu the menus *Target* and *Device*.

Build the Project

- Build the target by either selecting the *Build* icon  on the build toolbar or in the main menu bar select *Build / Build HelloWorld*.
- If any source file of the project contains any errors, they will be shown in the *Output Window - Build* tab. Use the editor to correct the error(s) in the source code, save the file and repeat the build.

- If there are no errors, the code can be downloaded to your i.MX31 device. For this to work you need to have established an Active Sync connection between your PC and your i.MX31 device as described in section 2.6. When the connection is established select *Build/Deploy HelloWorld* from the main menu bar.
- The individual steps of the download procedure can be viewed in the *Output Window - Build* tab.
- Wait until the download is complete.
- The newly created application was now deployed on your i.MX31 device. To start it select *My Device* on the target platform and go to the folder *Program Files/Helloworld* and double tap on “*Helloworld*”
- A window will open on your i.MX31 device that will print a **Hello World** message.
- Click on the *Close* icon in the window to close the application.



You have successfully passed the Getting Started part of this QuickStart. In this chapter you learned how to open a project, build an executable and transfer and run this executable on the target hardware.

3 Getting More Involved

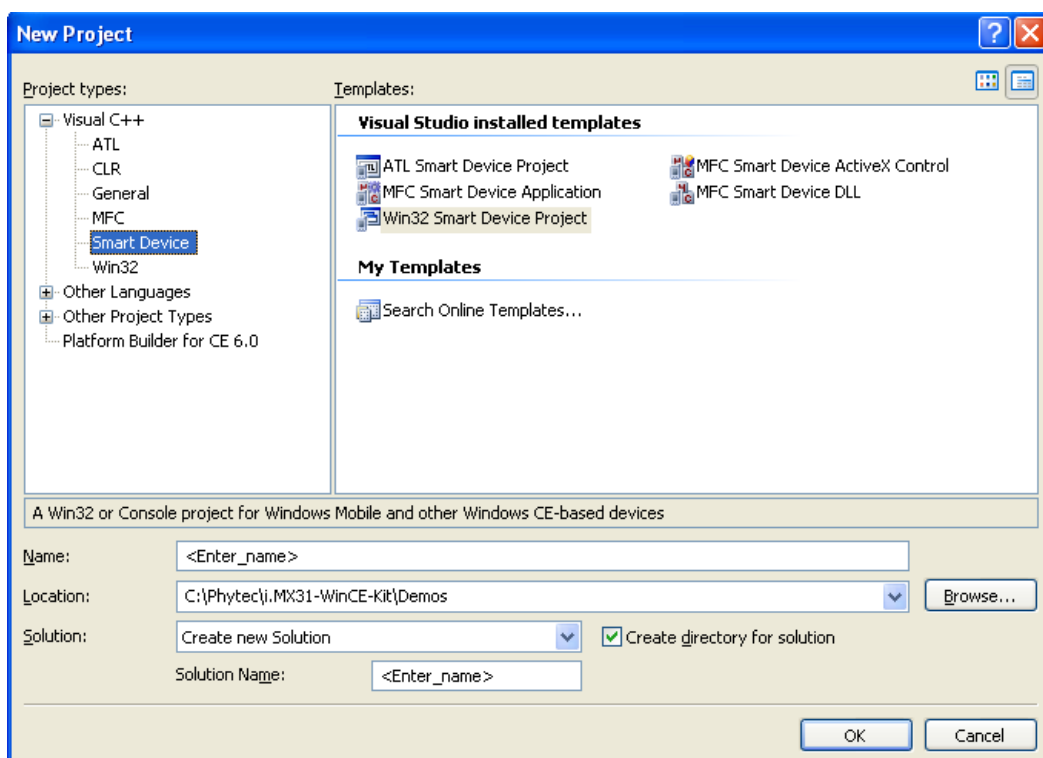


30 min

In this chapter you will learn how to configure the Visual Studio 2005 IDE (Integrated Development Environment), modify the source code from our example, create a new project and build and download a machine-readable output file to the target hardware.

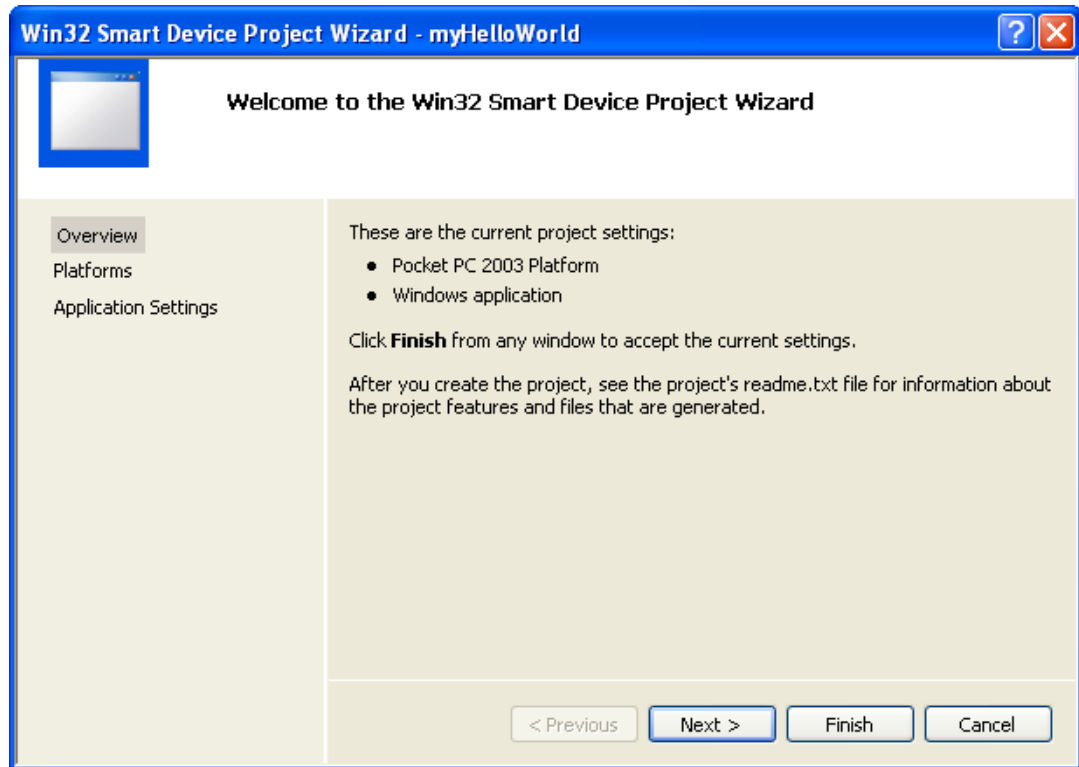
3.1 Creating a New Project

- To create a new project file select *File / New /Project* from the Visual Studio 2005 menu. This opens a dialog that will ask about the kind of project you wish to create.

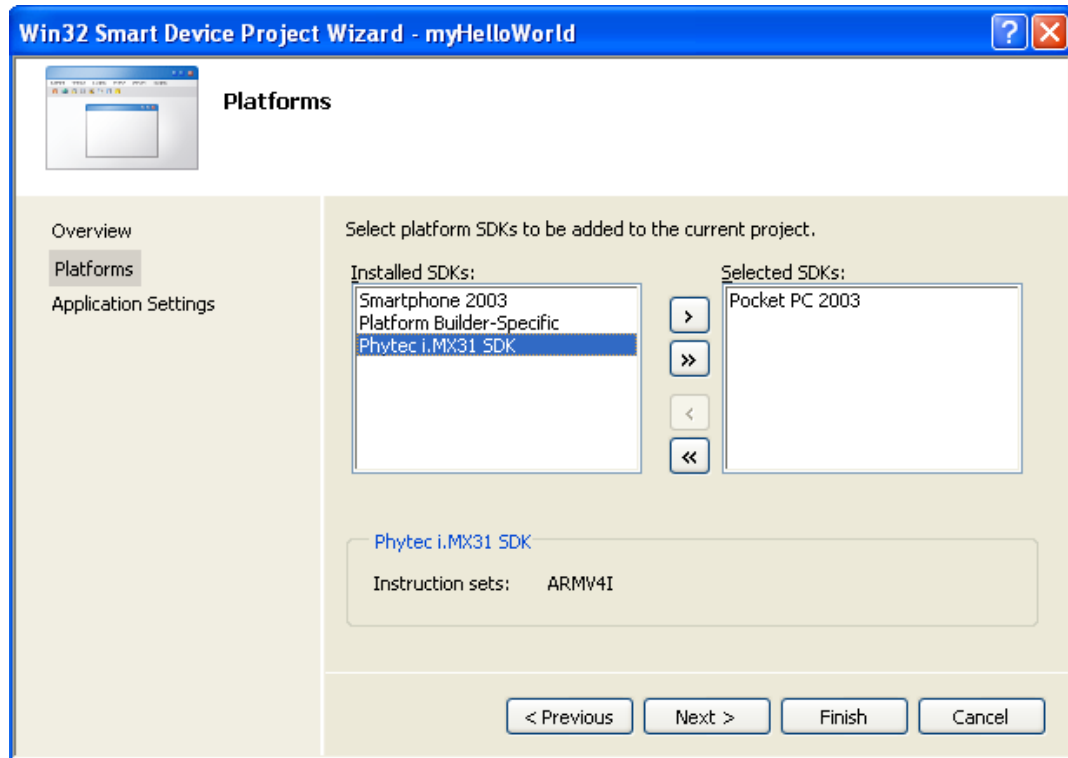


- Open the *Visual C++* tree and select *Smart Device*.

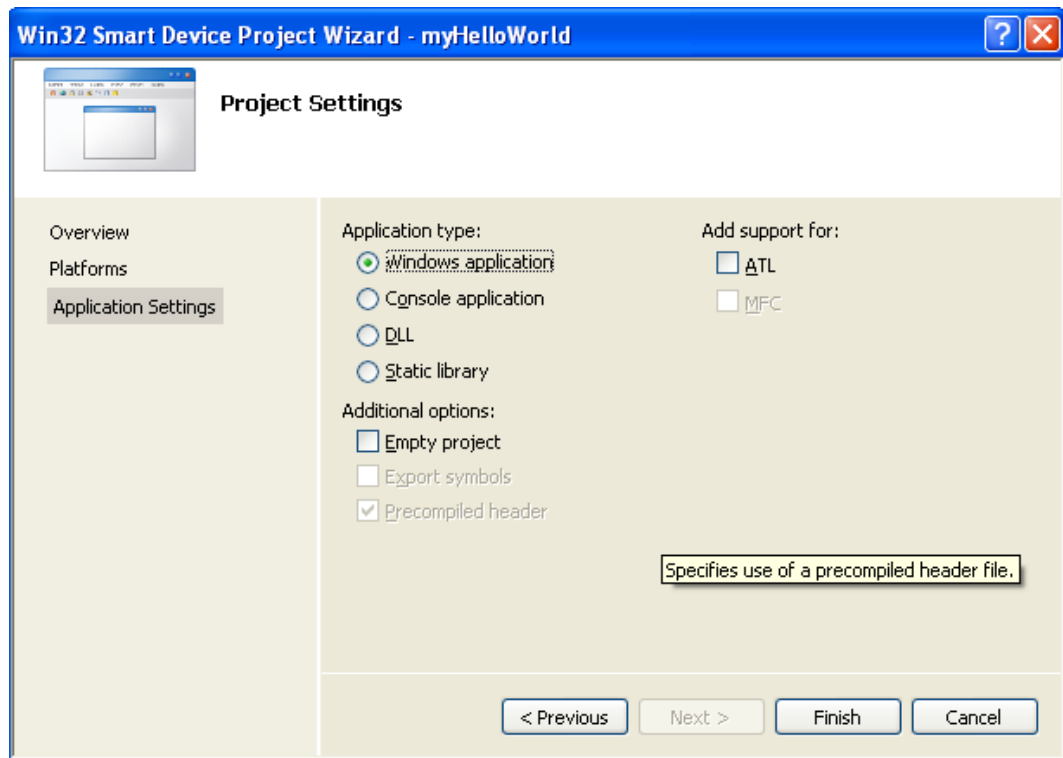
- In the *Templates* field select *Win32 Smart Device Project*.
- In the text field *Name*, enter the name of the project you wish to create, e.g. *myHelloWorld*.
- Click *OK*.



- Click *Next*.



- Click on the entry *Phytec i.MX31 SDK* in the field *Installed SDKs:* and press the > button. The *Phytec i.MX31 SDK* will appear in the *Selected SDKs* field.
- Select *Pocket PC 2003* in the field *Selected SDKs* and press the < button. This removes the *Pocket PC 2003* SDK from the list of selected SDKs.
- Press *Next*

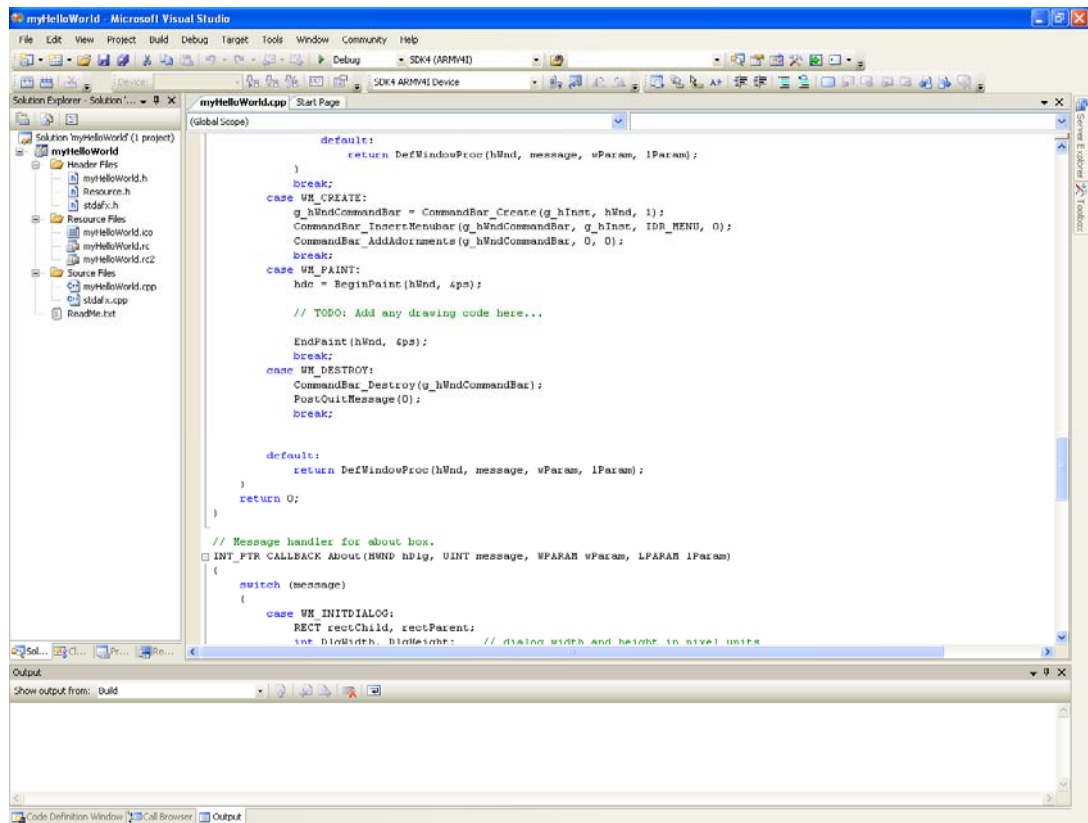


- Don't change the settings in this window and press *Finish*.

At this point you have created a new project for the i.MX31 board. The next step is to modify the C source file before building your project. This includes compiling, linking, locating and creating the executable.

3.2 Modifying the Source Code

- Open up the *myHelloWorld* tree and *Source Files*. Double-click on the *myHelloWorld.cpp* file to open the file in the source code editor.



```

case WM_PAINT:
    hdc = BeginPaint(hWnd, &ps);


```

- Replace this code section with the following:

```


case WM_PAINT:
    RECT rt;
    hdc = BeginPaint(hWnd, &ps);
    GetClientRect(hWnd, &rt);
    int i;
    for(i = 1; i <= 5 ; i++)
    {
        rt.top = rt.top + 30;
        DrawText(hdc, _T("Hello World!"), 12, &rt,
            DT_SINGLELINE | DT_VCENTER | DT_CENTER);
    }
    EndPaint(hWnd, &ps);
    break;

```

- Save the modified file by choosing *File / Save* or by clicking the floppy disk icon .

3.3 Building the Project

You are now ready to run the compiler and linker.

- Build the target by either selecting the *Build* icon  on the build toolbar or in the main menu bar select *Build / Build myHelloWorld*.
- If any source file of the project contains any errors, they will be shown in the *Output Window - Build* tab. Use the editor to correct the error(s) in the source code, save the file and repeat the build.
- If there are no errors, the code can be downloaded to your i.MX31 device. For this to work you need to have established an Active Sync connection between your PC and your i.MX31 device as described in section 2.6. When the connection is established select *Build/Deploy HelloWorld* from the main menu bar.
- The individual steps of the download procedure can be viewed in the *Output Window - Build* tab.
- Wait until the download is complete.
- The newly created application was now deployed on your i.MX31 device. To start it select *My Device* on the target platform and go to the folder *Program Files/myHelloworld* and double tap on “*myHelloworld*”

A window will open on your i.MX31 device that will print 5 **Hello World** message.



You have now modified source code, recompiled the code, created a downloadable file, and successfully executed this modified code.

4 Debugging

**40 min**

This Debugging section provides a basic introduction to the debug functions included in Visual Studio 2005. The most important features are described by using an existing example. For a more detailed description of the debugging features, please refer to the appropriate manuals provided by Microsoft.

4.1 Starting the Debugger

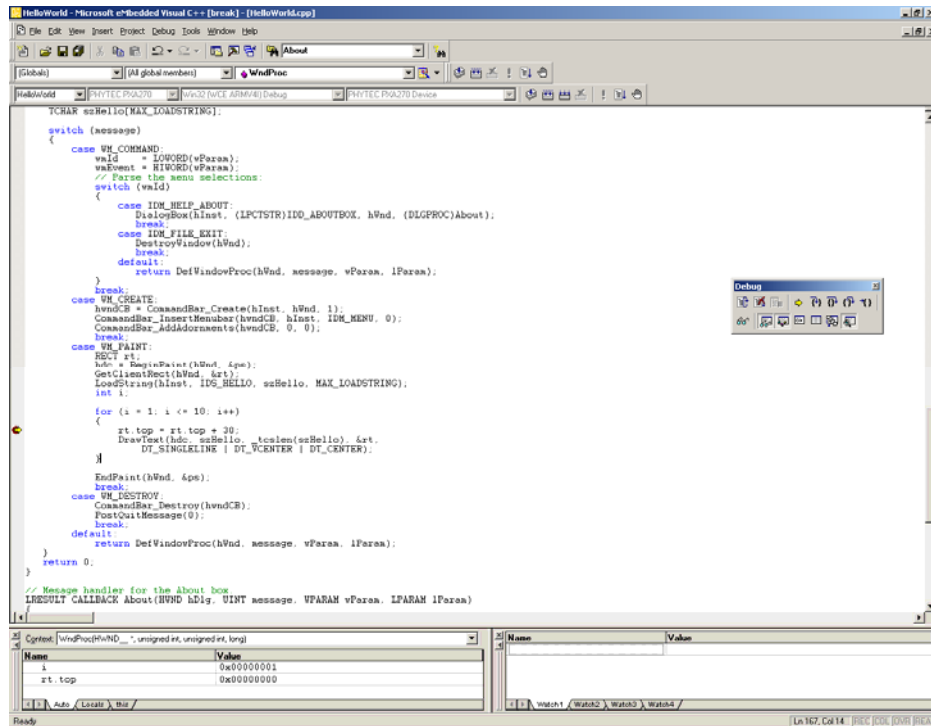
- Make sure that *Debug* is selected in the *Solution Configurations* pull-down menu.
- Open up the *myHelloWorld* tree and *Source Files*. Double-click on the *myHelloWorld.cpp* file to open the file in the source code editor.
- Locate the following code section and click on the line

```
rt.top = rt.top + 30;
```

- Select *Debug/Toggle Breakpoint* on the main menu bar or press F9 to set a breakpoint here. The red marker on the left-hand side of the selected line indicates the breakpoint.
- To start debugging with Visual Studio 2005, select *Debug/Start Debugging* or press F5.
- A progress bar will indicate the download process of the debug program.

If a problem occurs during data transfer, an error message will be displayed. If this should occur, make sure you have established a connection between your PC and your i.MX31 device as described in section 2.5.

If data transfer was successful, a screen similar to the one shown below will appear. The debug toolbar is displayed. In the lower part of the debug screen you will see the *Variables* and *Watch* windows.



You may need to open, resize and /or move some windows to make your screen look similar to the screen capture. You can open inactive windows by choosing the desired window from the *Debug/Windows* pull-down menu.

The debugger will run up to the code section you have marked with a breakpoint and stop automatically. Notice the yellow arrow pointing to that breakpoint

You can click on *Debug/Toggle Breakpoint* or press F9 again to remove the breakpoint you have set.

4.2 Visual Studio 2005 Debug Features

- The *Debugger* window toolbar gives access to the following debug commands: *Restart*, *Stop Debugging*, *Break Execution*, *Show Next Statement*, *Step Into*, *Step Over*, *Step Out* and *Run to Cursor*.

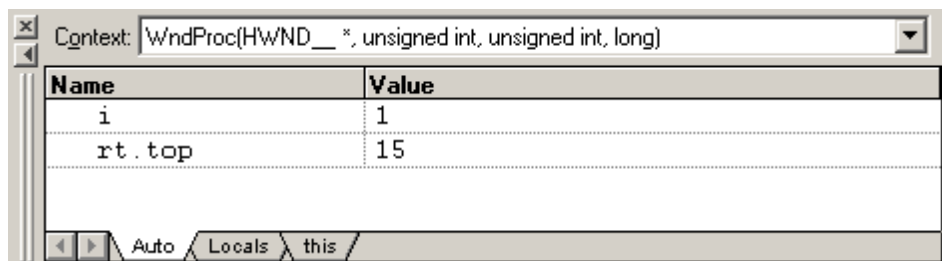


- The first button on the debugger toolbar is the *Start Debugging* button. This starts or continuous debugging.
- The *Break All* halts execution and the editor shows the current source code line.
- The *Stop Debugging* button stops the debugger and will lead you back to your project screen.
- The *Restart* button restarts the execution of the program from the beginning.
- The *Show Next Statement* button allows you to go through your program code line by code line.
- The first button allowing exact control of the program execution is the *Step Into* button. The *Step Into* command performs the execution of the command line to which the *Current-Statement Arrow* points. This can be a C command line or a single assembler line, depending on the current display mode. If the command line is a function call, *Step Into* jumps to the C function or subroutine, enabling you to explore the code contained in the accessed subroutine.
- The *Step Over* button is next on the debugger toolbar. The *Step Over* command executes the command line, to which the *Current-Statement Arrow* points. This can be a C command line or a single assembler line, depending on the current display mode. If the command line is a function call, the function will be executed without single stepping into the function.
- The next button is the *Step Out* button. *Step Out* is used to exit a function you are currently in. *Step Out* is very useful if you find yourself in a function you are not interested in and need to return quickly to your intended function.

- The *Hex* button toggles the display style of watch variables between hexadecimal and decimal.
- The last button pops up a menu where you can choose different windows useful for debugging, like watch windows, process information, memory information and calling stack.



4.3 Using the Visual Studio 2005 Debug Features

- The *Variables window – Auto* tab automatically shows the value of the local variable *i*. You can change the number base from decimal to hexadecimal by right clicking on the variable and selecting *Hexadecimal Display*.



- Click *Step Over* several times and watch the value of *i* count up.
- As you can see in the source code, the *for{} loop* will end if *i* becomes equal to 5. To leave the *for{} loop*, change the value of *i* by selecting the value, changing it to **10** and pressing **<Enter>**. Now repeat clicking on *Step Over* until you leave the loop.
- Remove the breakpoint by clicking into the source code line that has the breakpoint and press F9 or the *Insert/Remove Breakpoint* icon.
- Click in the source code, at **return 0**; and choose *Run to Cursor* from the *debug* toolbar. Your program will be executed until it reaches this line.

4.4 Running, Stopping and Resetting

- To run your program without stopping at any time, delete all breakpoints by clicking on the *Insert/Remove Breakpoint* icon.
- Click the *Go*  button.
- **Hello World!** will be displayed on the screen of your i.MX31 device.
- You can use the *Stop Debugging*  button to stop program execution at any time.

4.5 Changing Target Settings for the "Executable Version"

After successfully debugging the program, next change the project and the target settings in order to create an executable file that can then be downloaded to and executed out of the memory on the phyCORE[®]-i.MX31.

- Make sure the program execution is stopped.
- Exit the current debug session by selecting *Stop Debugging*.
- In the *Solution Configurations* pull down menu select 'Release'.
- Build and execute your project as described in 3.3.

You can now watch your final example execute and **Hello World!** will be displayed on the screen of your i.MX31 device.



You have successfully finished the debug section of this Quickstart. You learned how to set breakpoints, run your program to a specific line of code and inspect variables.

5 Building an image

**50 min**

In this section you will learn how to add your own application to a WinCE project, create a new image and download this image on the i.MX31. We will use the application build and debugged in the chapters before as an example.

5.1 Changing an image

First you need a project to build the image with. In this example you can use the project we provide on the i.MX31 WinCE-Kit CD, which is already installed on your system.

- Open Visual Studio 2005, if not already open.
- To open the project select *File/Open/Project/Solution* from the Visual Studio 2005 menu bar.
- Browse to the folder *C:\PHYTEC\PCM037_phyCORE-i.MX31\WinCE-Kit\iMX31_Phytec_Projekt3*.
- Select the project *i.MX31_Phytec_Projekt3*.

When the project is loaded you will see the project in the *Solution Explorer* Tab in the left window.

Open the Tree *i.MX31_Phytec_Projekt3\Parameter Files\i.MX31_Phytec:ARMMV4I(Active)* and double click on *project.bib*. Under the “Files” section add the following line:

```
HelloWorld.exe "C:\Phytec\PCM037_phyCORE-i.MX31\i.MX31-WinCE-Kit\Demos\myHelloWorld\myHelloWorld\Phytec i.MX31 SDK (ARMV4I)\Debug\myHelloWorld.exe" NK
```

This will add the executable HelloWorld.exe to the Windows directory of the target. The path tells the platform builder where to find the executable that should be added to the image and the

parameter NK specifies the name of the memory region where it should be added to.

To build a new image select *Build/Build /Solution* from the Visual Studio 2005 menu bar. The build process will take about 20 minutes, depending on your host platform hardware.



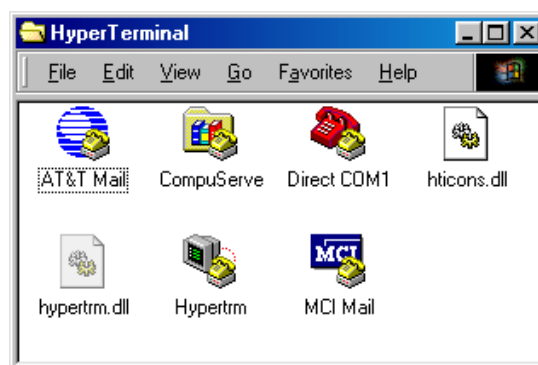
You don't have always to do a complete build process that takes this long. If you just want to add a file to the image like in the example before, you can do this by selecting *Build\Copy Files to Release dir*. This copies all necessary files to the Release directory. Then you can build the image with *Build\Make Run-Time image*. This takes only about 5 minutes. Please refer to the Visual Studio 2005/Platformbuilder documentation for more information.

5.2 Download an image

In the next step we want to download the image to the target. For this step you need a terminal program like HyperTerminal.

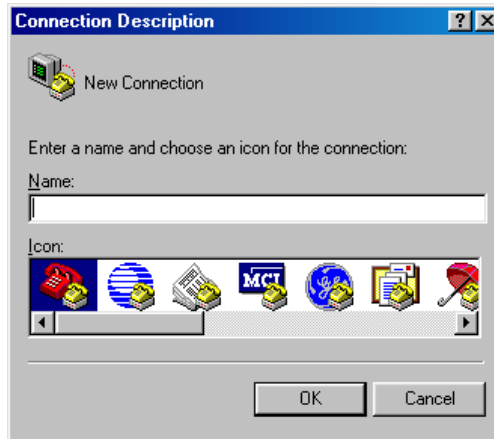
Start the HyperTerminal program within the *Programs/Accessories* bar.

The HyperTerminal main window will now appear:



Double-click on the HyperTerminal icon “*Hypertrm*” to create a new HyperTerminal session.

The Connection Description window will now appear. Enter “COM Direct” in the *Name* text field.

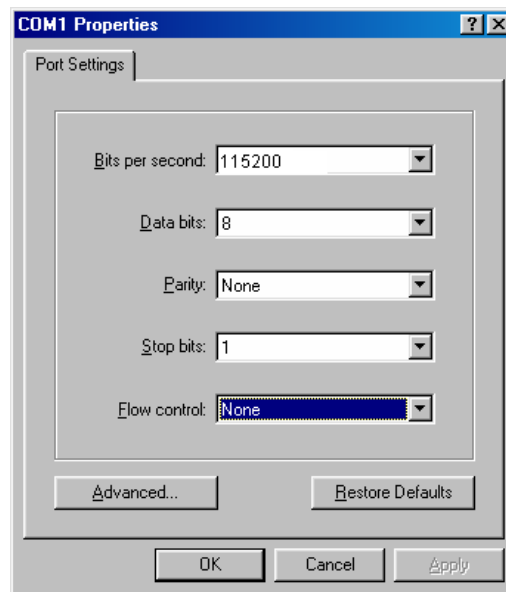


Next click on *OK*. This creates a new HyperTerminal session named “COM Direct” and advances you to the next HyperTerminal window.



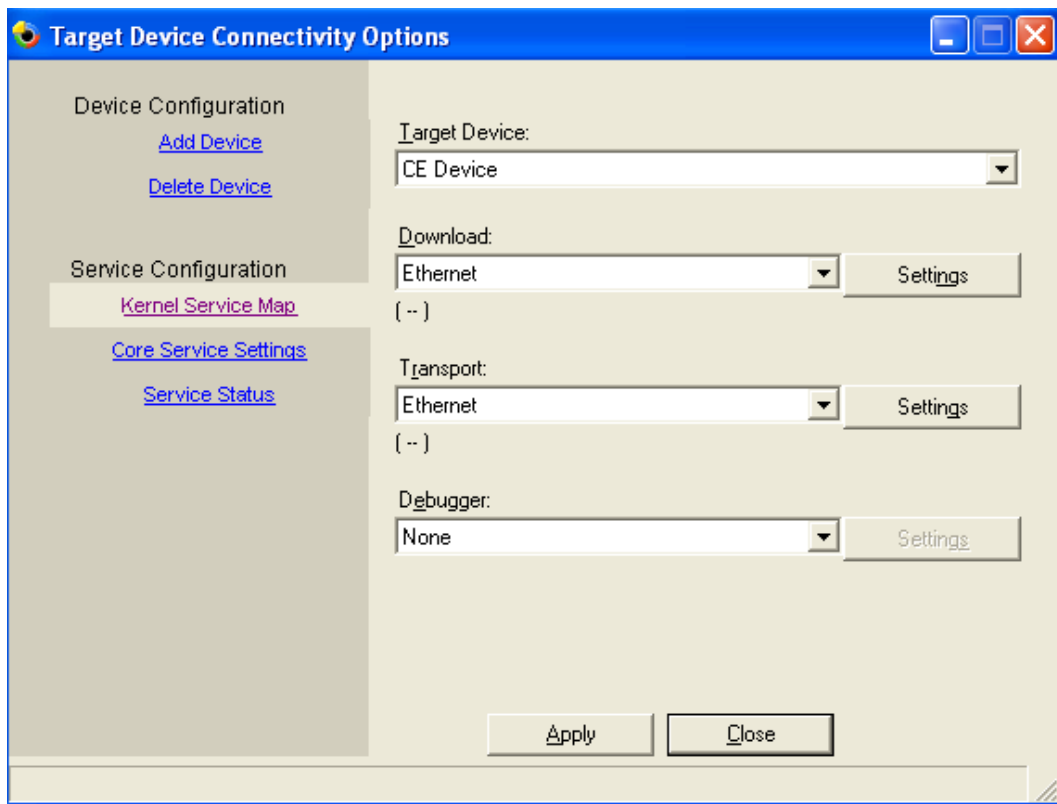
The *COM Direct Properties* window will now appear. Specify *Direct to COM1/COM2* under the *Connect Using* pull-down menu (be sure to indicate the correct COM setting for your system).

Click the *Configure* button in the *COM Direct Properties* window to advance to the next window (*COM1/COM2 Properties*).

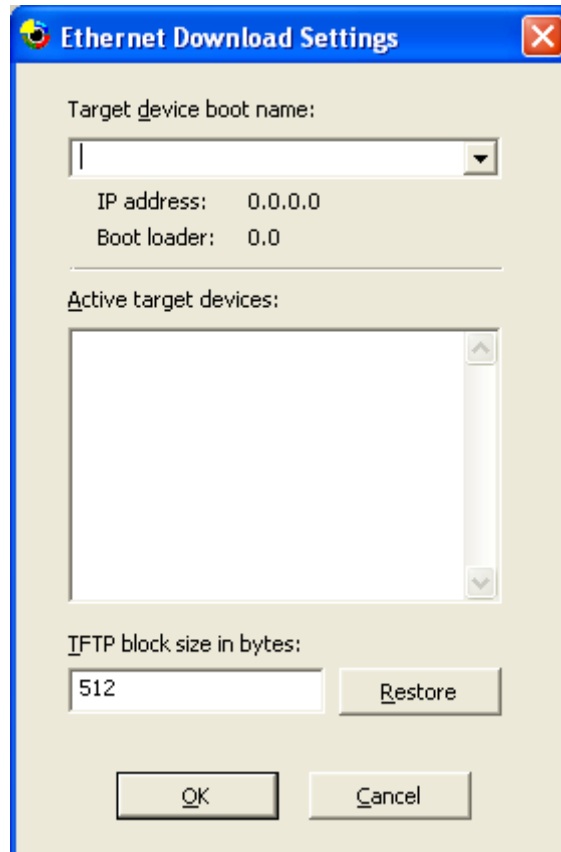


- Set the following COM parameters: Bits per second = 115200; Data bits = 8; Parity = None; Stop Bits = 1; Flow Control = None.
- Selecting *OK* advances you to the *COM Direct-HyperTerminal* monitoring window. Notice the connection status report in the lower left corner of the window.
- Connect the UART 3 (connector P1 - BOTTOM) to the computer.
- Power up the baseboard
- You will now see some output messages from the bootloader in the HyperTerminal window. Press space to stop the bootloader.
- Connect the cross-over Ethernet cable with the connector X23 on the target and the right network card of your host.
- In the HyperTerminal window you can press '0' to change the IP address of the device and '1' to change the network mask. Change the default settings so it will fit to the network settings on your PC.
- Press '3' to disable DHCP.
- Press '5' to change the *Autoboot* entry to *NK* from *NOR*
- Press 'S' to save the configuration.
- Select *Target/Connectivity Option* from the Visual Studio 2005 menu bar.

- Select Ethernet for the *Download* and *Transport* settings from the drop down box.



- Click on the *Settings* button on the right of the *Download* Drop down box. A window will appear. Leave this window open.
- Change to the Hyperterminal window and press 'd' on the keyboard to start the download of the image
- You will see some output messages followed by a BOOTME message.
- Go back to Visual Studio. In the window *Ethernet download settings* a new entry should appear in the *Active target devices* list. Select the device and close the window.

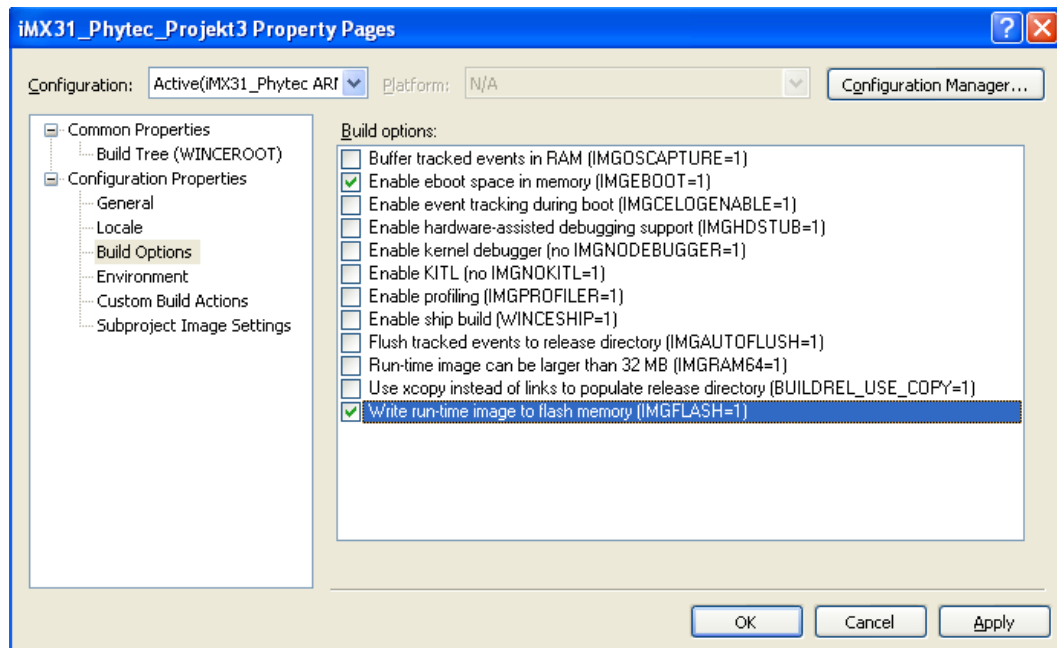


- Select *Target/Attach Device* from the Visual Studio menu bar. A download message with a status bar should appear and the download should start.

When the download is finished, the image should start. Calibrate the touch panel, then navigate to the folder *MyDevice\Windows*. There you find your HelloWorld application that can be executed.

In this example the image that was build is a RAM image, when you reset the device, the original image from flash will be started again.

To build an image that can be stored in flash, right click on the entry *iMX31_Phytec_Projekt3* in the solution explorer and select *Properties*.



In the Properties dialog select *Configuration Properties* and *Build Options*. Check the “Write run-time image to flash memory” and rebuild the solution.

Please read Appendix A “How to install Windows CE on the i.MX31 Kit” for informations on how to flash the image.



You have successfully finished this QuickStart.

6 Summary

This QuickStart Instruction gave a general "Rapid Development Kit" description, as well as software installation advice and an example program enabling quick out-of-the box start-up of the phyCORE[®]-i.MX31 in conjunction with WinCE.

In the Getting started section you learned how to configure your host to provide a basis for working with your target platform. You installed the Rapid Development Kit software and you learned to copy and run a program on the target.

In the Getting More Involved section you got a step-by-step instruction on how to modify the example, create and build new projects and copy output files to the phyCORE -i.MX31 using Visual Studio 2005.

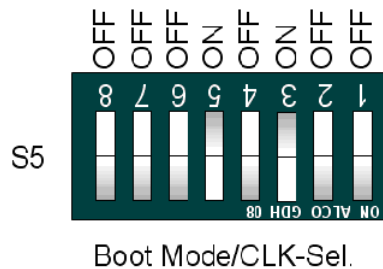
The Debugging part of this QuickStart gave you information on setting up and using the debugger with Visual Studio 2005. You learned how to set breakpoints, watching and changing variables content.

In the Building an Image section you learned how to build a new image based on a preconfigured BSP and project.

Appendix A How to install WindowsCE on the i.MX31 Kit

Installing the bootloader

- 1) Configure the switch S5 to boot with UART

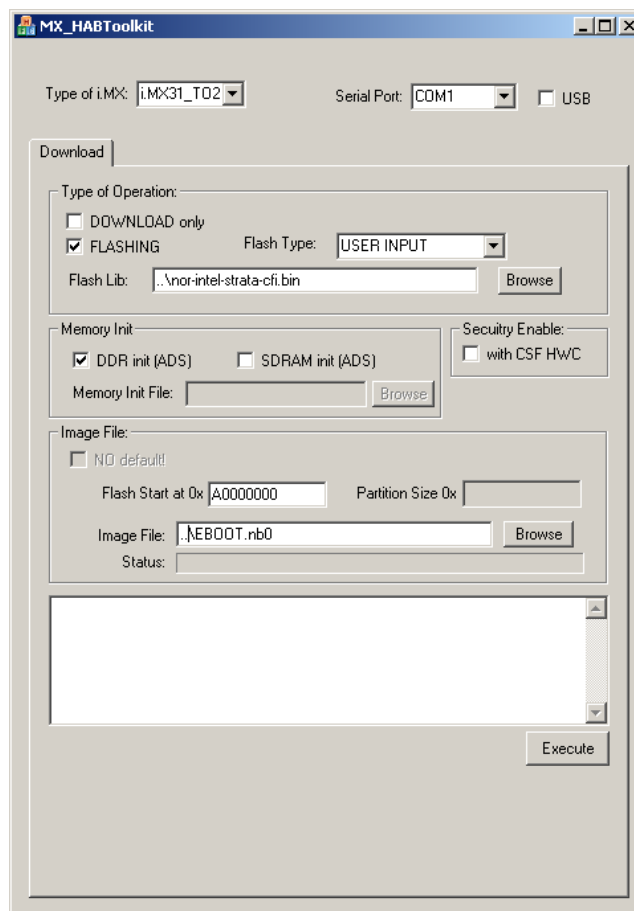


- 2) Connect the UART 1 (connector P1 - TOP) to the computer



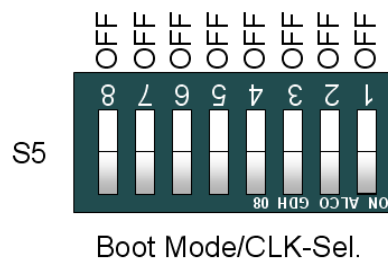
- 3) Power up the baseboard
- 4) Start the HABToolKit program by opening a file explorer, navigate to the directory *C:\PHYTEC\PCM037_phyCORE-i.MX31\WinCE-Kit\Tools\HABToolKit iMX31* and double-click on *MX_HABToolkit.exe*
- 5) Fill in the HABToolKit windows like below:
 - Choose i.MX31_TO2 for “type of i.MX”
 - Choose the number of the used serial port for “Serial Port”
 - Enable “FLASHING”
 - Choose USER INPUT for “Flash Type”

- Choose the library binary (nor-intel-strata-cfi.bin) with the *Browse* button and navigate to the *C:\PHYTEC\PCM037_phyCORE-i.MX31\WinCE-Kit\Tools\HABToolKit iMX31* directory
- Set the “Flash Start at 0x” at a0000000
- Choose the binary to flash (eboot.nb0) with the *Browse* button and navigate to the directory *C:\PHYTEC\PCM037_phyCORE-i.MX31\WinCE-Kit\Tools\HABToolKit iMX31*
- Click on “Execute”



6) When finished, power down the baseboard

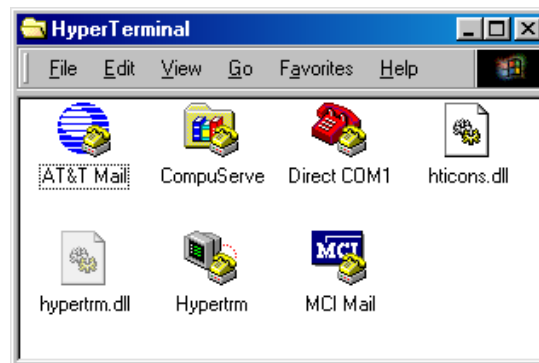
7) Configure the switch S5 to boot with NOR Flash



Installing the image

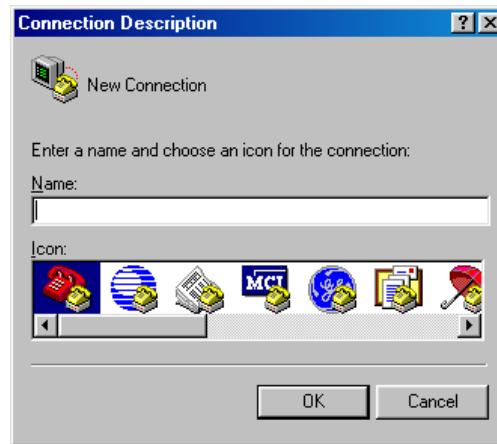
Start the HyperTerminal program within the *Programs/Accessories* bar.

The HyperTerminal main window will now appear:



Double-click on the HyperTerminal icon “*Hypertrm*” to create a new HyperTerminal session.

The Connection Description window will now appear. Enter “COM Direct” in the *Name* text field.

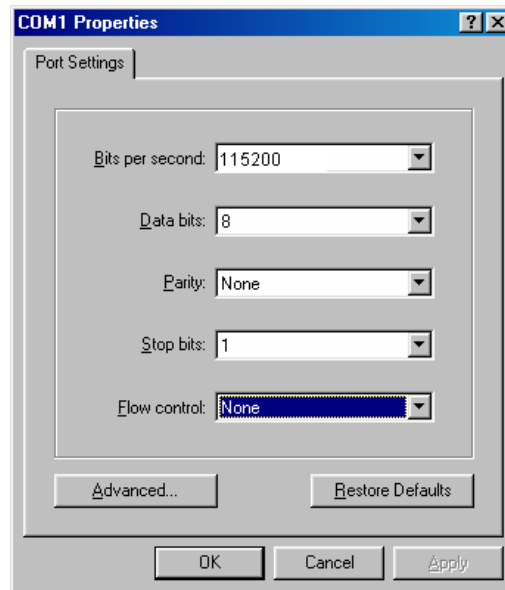


Next click on *OK*. This creates a new HyperTerminal session named “COM Direct” and advances you to the next HyperTerminal window.



The *COM Direct Properties* window will now appear. Specify *Direct to COM1/COM2* under the *Connect Using* pull-down menu (be sure to indicate the correct COM setting for your system).

Click the *Configure* button in the *COM Direct Properties* window to advance to the next window (*COM1/COM2 Properties*).



- Set the following COM parameters: Bits per second = 115200; Data bits = 8; Parity = *None*; Stop Bits = 1; Flow Control = *None*.
- Selecting *OK* advances you to the *COM Direct-HyperTerminal* monitoring window. Notice the connection status report in the lower left corner of the window.
- Connect the UART 3 (connector P1 - BOTTOM) to the computer.

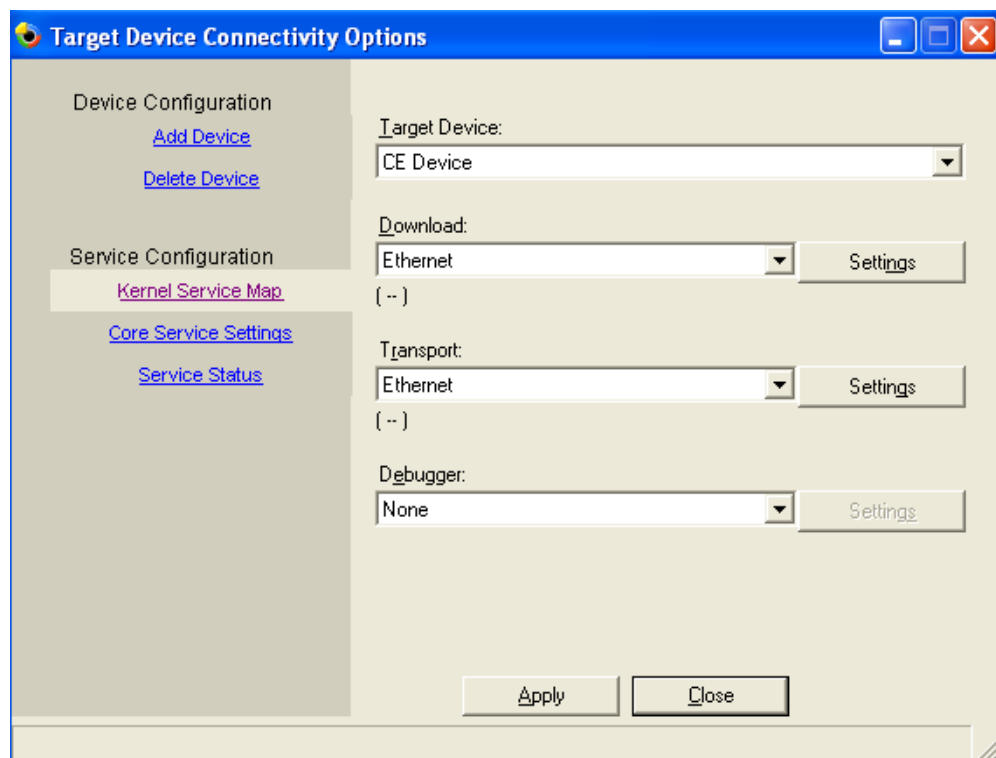


Be sure to use the right UART connector after using the HABToolkit. HABToolkit works with connector UART 1, the Eboot messages will be output on UART 3.

- Power up the baseboard
- You will now see some output messages from the bootloader in the HyperTerminal window. Press space to stop the bootloader.
- Connect the cross-over Ethernet cable with the connector X23 on the target and the right network card of your host.
- In the HyperTerminal window you can press '0' to change the IP address of the device and '1' to change the network mask.

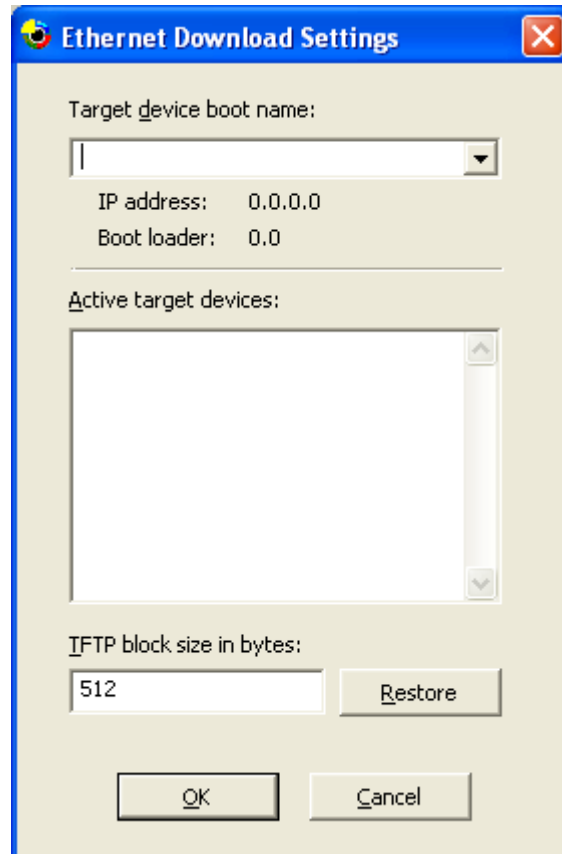
Change the default settings so it will fit to the network settings on your PC.

- Press '3' to disable DHCP.
- Press '5' to change the *Autoboot* entry to *NK from NOR*
- Press 'S' to save the configuration.
- Start Microsoft Visual Studio 2005
- Select *Target/Attach Device* from the Visual Studio 2005 menu bar. In the following *Select a run-time image* dialog, navigate to *C:\PHYTEC\PCM037_phyCORE-i.MX31\WinCE-Kit\Image* and select *nk.bin*.
- Select *Target/Connectivity Option* from the Visual Studio 2005 menu bar.
- Select Ethernet for the *Download* and *Transport* settings from the drop down box.



- Click on the *Settings* button on the right of the *Download* Drop down box. A window will appear. Leave this window open.

- Change to the Hyperterminal window and press 'd' on the keyboard to start the download of the image
- You will see some output messages followed by a BOOTME message.
- Go back to Visual Studio. In the window *Ethernet download settings* a new entry should appear in the *Active target devices* list. Select the device and close the window.



- Select *Target/Attach Device* from the Visual Studio menu bar. A download message with a status bar should appear and the download should start.
- When the download is finished, the image has been downloaded in RAM. Now go to the HyperTerminal window, the bootloader should state a message to program the image now in flash. Press 'Y' to confirm this.

- When programming the flash is completed, the bootloader will state “spin forever”. Reset the board by pressing the reset button. WinCE should boot now.

Document: WinCE-Kit with phyCORE[®]-i.MX31 QuickStart
Instructions
Document number: L-699e_2, September 2007

How would you improve this manual?

Did you find any mistakes in this manual? _____ page

Submitted by:

Customer number: _____

Name: _____

Company: _____

Address: _____

Return to:

PHYTEC Technologie Holding AG
Robert-Koch-Str. 39
55129 Mainz, Germany
Fax: +49 (6131) 9221-26

