

QuickStart Instructions

WEC 7-Kit

phyCORE[®]-OMAP44xx

**Using Microsoft Visual Studio 2008
Software Development Tool Chain**

Note: The PHYTEC WinCE-phyCORE-OMAP44xx includes the electronic version of the English phyCORE[®]-OMAP44xx Hardware Manual

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1 Introduction

**5 min**

This QuickStart provides general information on the PHYTEC phyCORE[®]-OMAP44xx Single Board Computer (SBC). It gives you also an overview of Microsoft's Visual Studio 2008 software development tool chain and instructions on how to run example programs on the phyCORE[®]-OMAP44xx, mounted on the PHYTEC phyCORE[®] Development Board, in conjunction with Visual Studio 2008.

Please refer to the [phyCORE[®]-OMAP44xx 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[®]-OMAP44xx Hardware Manual.

1.1 Rapid Development Kit Documentation

This "Rapid Development Kit" (RDK) includes the following electronic documentation on the enclosed "PHYTEC WinCE-phyCORE-OMAP44xx-Disc":

- the PHYTEC [phyCORE[®]-OMAP44xx Hardware Manual](#)
- controller [User's Manuals and Data Sheets](#)
- this QuickStart Instructions with general "Rapid Development Kit" description, software installation advice and an example program, enabling quick out-of-the box start-up of the phyCORE[®]-OMAP44xx in conjunction with the Microsoft Visual Studio 2008 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 Manual gives 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®-OMAP44xx in conjunction with Microsoft's Visual Studio 2008. 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 2008 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®-OMAP44xx using the Microsoft tools.
- 3) The "Debugging" section demonstrates simple debug functions using Visual Studio 2008 debug environment.

In addition to the dedicated data for this Rapid Development Kit, the PHYTEC WinCE Kit disc 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 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 be path of this QuickStart.



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



Provides 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 manual.



You can find information to solve problems.

1.5 System Requirements

The use of this "Rapid Development Kit" requires:

- the PHYTEC phyCORE®-OMAP44xx
- the phyCORE® Development Board with the included DB-9 serial cable, USB A/mini-B cable, Ethernet cross-over cable and AC adapter supplying 12 VDC (min. 2 A)
- Windows Embedded Compact 7 (Eval version)
- the PHYTEC WinCE-phyCORE-OMAP44xx-Disc for WEC 7
- an IBM-compatible host-PC (586 or higher running with WindowsXP and at least 10 GB free hard disc space)

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

PHYTEC

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

1.6 Microsoft Visual Studio 2008 Development Tool Chain

Microsoft's Software development tools for the phyCORE-OMAP44xx architecture aid every level of developer from the professional applications engineer to the student just learning about embedded software development.

Visual Studio 2008 is the version of Microsoft's popular IDE that supports also WEC 7. The needed Platform Builder is integrated in Visual Studio 2008. So it is possible to customize the Windows Embedded Compact Image and write user applications with just one tool. Visual Studio 2008 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 2008 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 2008 editor offers many standard and advanced software editing features like:

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

The Visual Studio 2008 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 2008, 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[®]-OMAP44xx, 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 2008.

2.1 Installing Visual Studio 2008

To install Visual Studio 2008 on your desktop PC insert the DVD labeled “Visual Studio 2008 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 and start “setup.exe” manually. Visual Studio 2008 needs at least 2 GB free hard disc space to install.

The following screen appears:



Click “Install Visual Studio 2008” and follow the instructions of the setup program.

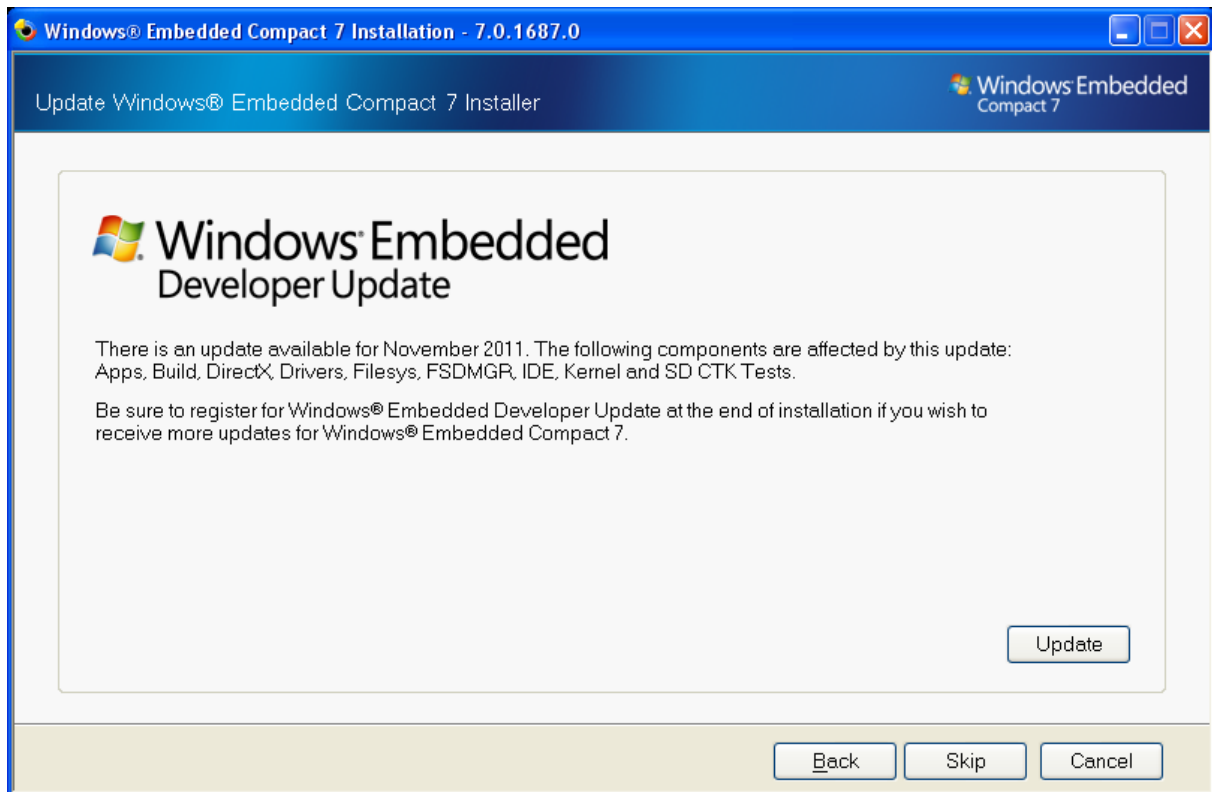
After installation you have to download and install the Visual Studio 2008 Service Pack 1 at:

<http://www.microsoft.com/download/en/details.aspx?id=10986>

2.2 Installing Platform Builder

To install the Platform Builder Plug-in for Visual Studio 2008, please insert the DVD labeled “Windows Embedded Compact 7” in your DVD drive. The setup should start automatically. If not, open a windows file explorer, select your DVD drive and start “WindowsEmbeddedCompact7.exe” manually. On the opening window click “Install” to start further installation steps.

To getting an up-to-date development environment, you have to click “Update” for downloading the newest installation files. If you don’t have internet connection, skip the update process and download it later. It is recommended to download the updates for best environment compatibility.

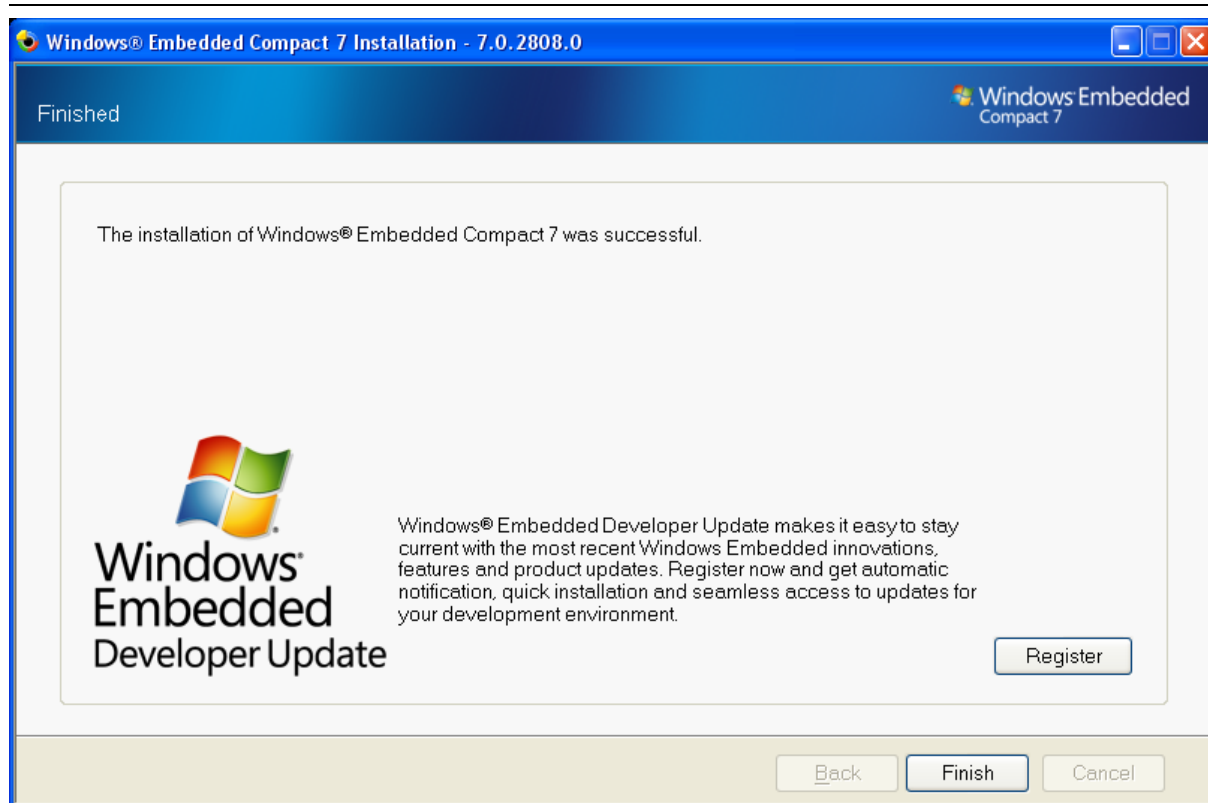


Follow the install instructions and choose “Full install” to get the hole product support.



During the setup you have to enter a product activation key. You will find it on the front of the DVD case.

After complete installation, it is recommended to register for the Windows Embedded Developer Update program to get all necessary updates. Click “Register” for the registration.



2.3 Installing WinCE phyCORE-OMAP44xx-Kit software

In this section you will find a description of the WinCE-phyCORE-OMAP44xx-Kit setup. This setup will install the following tools and programs:

- SDK for phyCORE-OMAP44xx WEC 7.0
- A binary BSP for the phyCORE-OMAP44xx and a project to build a new image
- Example programs for Visual Studio 2008
- Digital version of this QuickStart instruction and the hardware manuals

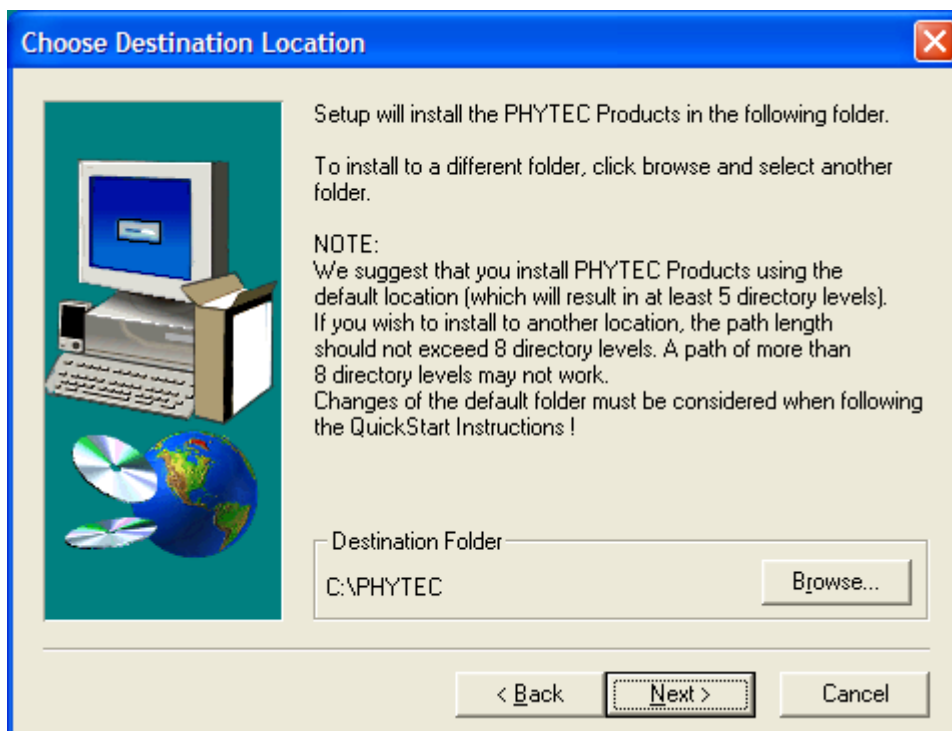
The phyCORE-OMAP44xx SDK for WinCE is needed for writing target-oriented applications. It will integrate in the Visual Studio IDE, offering a new target device for code generation. Also the SDK includes all functionality that is included in the image that runs on the phyCORE-OMAP44xx. Therefore using 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”.

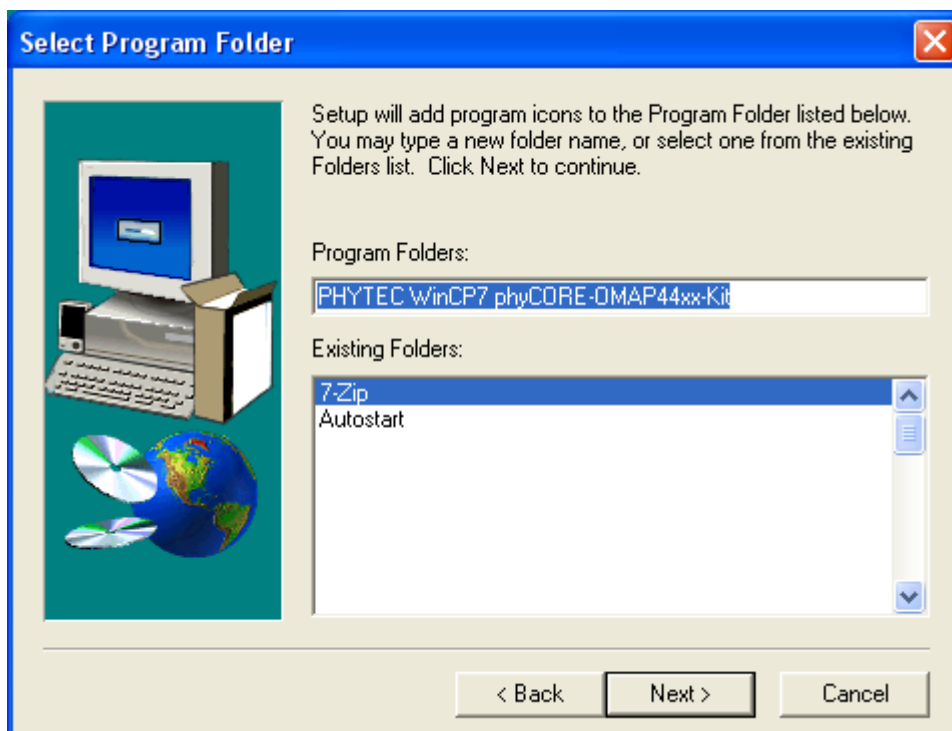


For proper installation of the SDK it is essential to first install Visual Studio 2008 as described in chapter 2.1.

Insert the CD labeled “PHYTEC phyCORE-OMAP44xx” in your CDRom/DVD drive and start *setup.exe*.

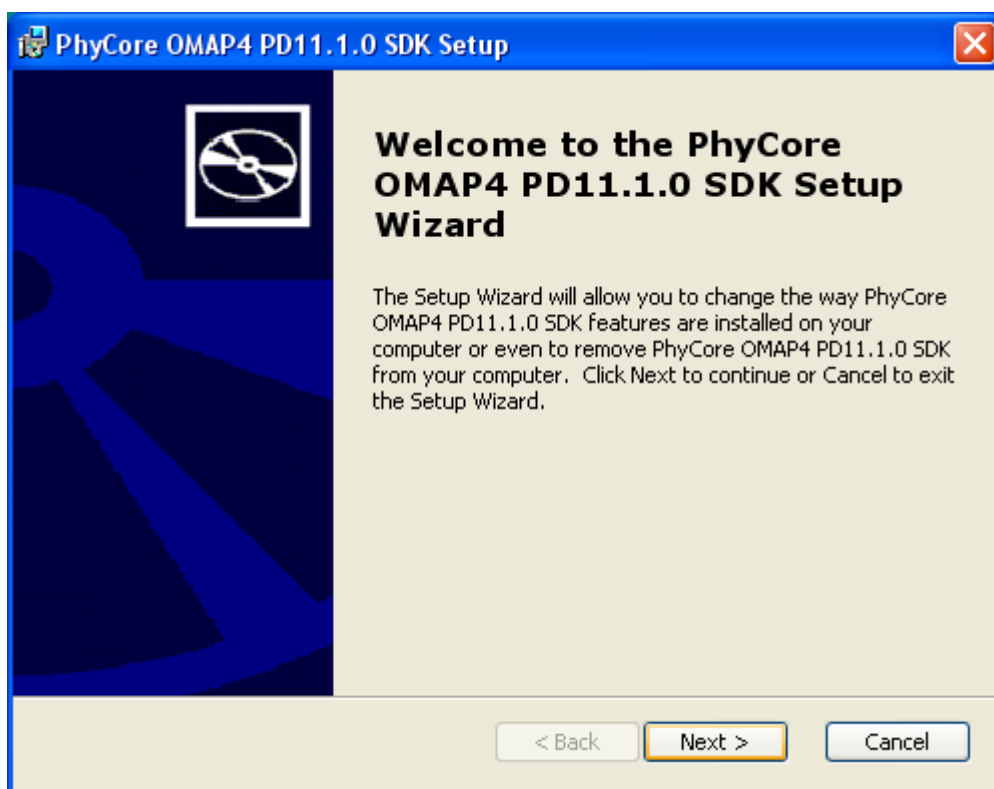


In this dialog you are asked for a destination path for installing the demo software and the manuals. We recommend to use the default path for working with this QuickStart.



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 BSP for the PHYTEC phyCORE-OMAP44xx 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. Choose *complete* when being asked for the amount of files to install.

2.4 Installing Microsoft Active Sync 4.5

To be able to upload the software you are developing to your phyCORE-OMAP44xx device you need Microsoft Active Sync 4.5. When your PC is connected to your phyCORE-OMAP44xx 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.msp>

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.msi.

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-phyCORE-OMAP44xx-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[®]-OMAP44xx to interface to a host-PC

To be able to interface your phyCORE-OMAP44xx with your PC you must first setup the correct network settings on your phyCORE-OMAP44xx. For downloading software to the phyCORE-OMAP44xx 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 (12V) on your board.



The power connector should have 12 VDC inside and outside should be ground.



If Windows Embedded Compact didn't start within 1 minute, you have a kit with linux preinstalled. Please continue with Appendix A "How to install Windows Embedded Compact on the phyCORE-OMAP44xx Kit" and continue here after you have finished this chapter successfully.

When Windows Embedded Compact 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 phyCORE-OMAP44xx device should already be connected to the PC as described in chapter 2.4 and running.

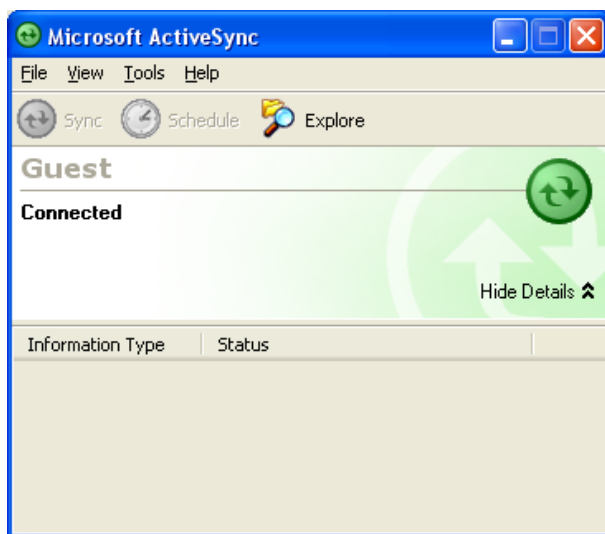
ActiveSync should already be running after the installation in chapter 2.4.

Connect the USB A/mini-B cable with the USB OTG connector 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.

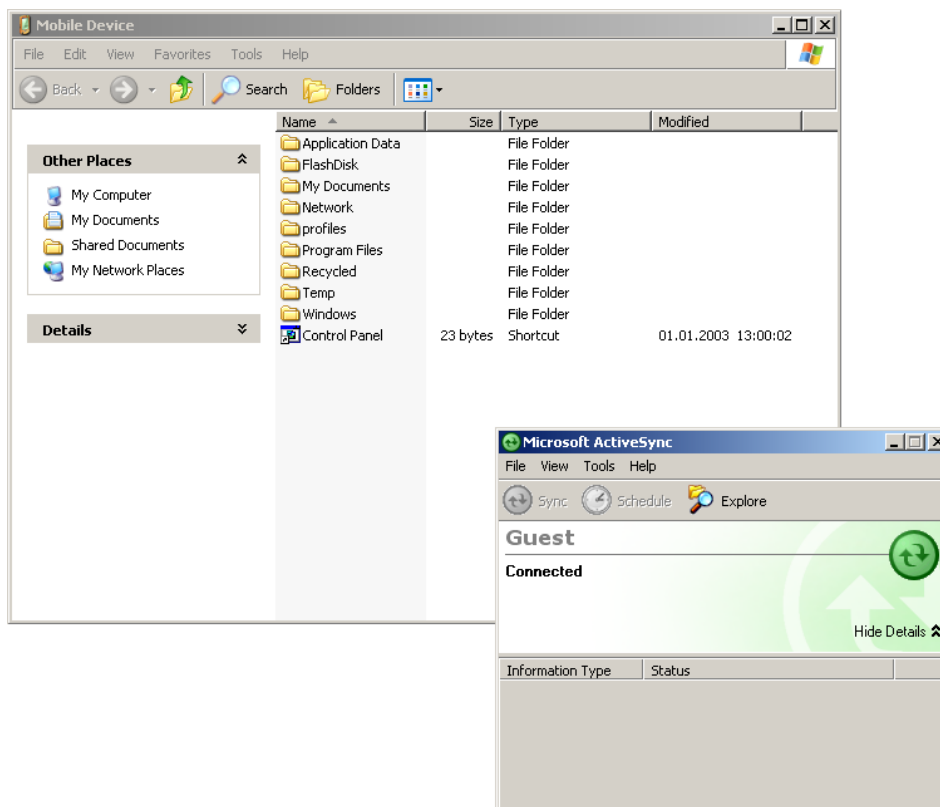


Your PC is now connected to your phyCORE-OMAP44xx device.

2.7 Downloading Example Code with Active Sync

To download the example code provided on the WinCE-phyCORE-OMAP44xx-Disc, you need to have Active Sync running on your PC to be able to establish a connection to your phyCORE-OMAP44xx device as described in the previous chapter.

Click *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 Embedded Compact installation on your phyCORE-OMAP44xx device.



Open a file manager and navigate to the folder
C:\PHYTEC\PCM049_phyCORE-OMAP44xx\WinCE-Kit\QuickStart\Demos
\Demo\HelloWorld\HelloWorld\Phytec phyCORE-OMAP44xx SDK
(ARMV4I)\Debug.

Select *HelloWorld.exe* and copy it to the *Mobile Device* window in the folder *Program Files* using drag and drop. If a question regarding file conversion arises, just confirm with *OK*.

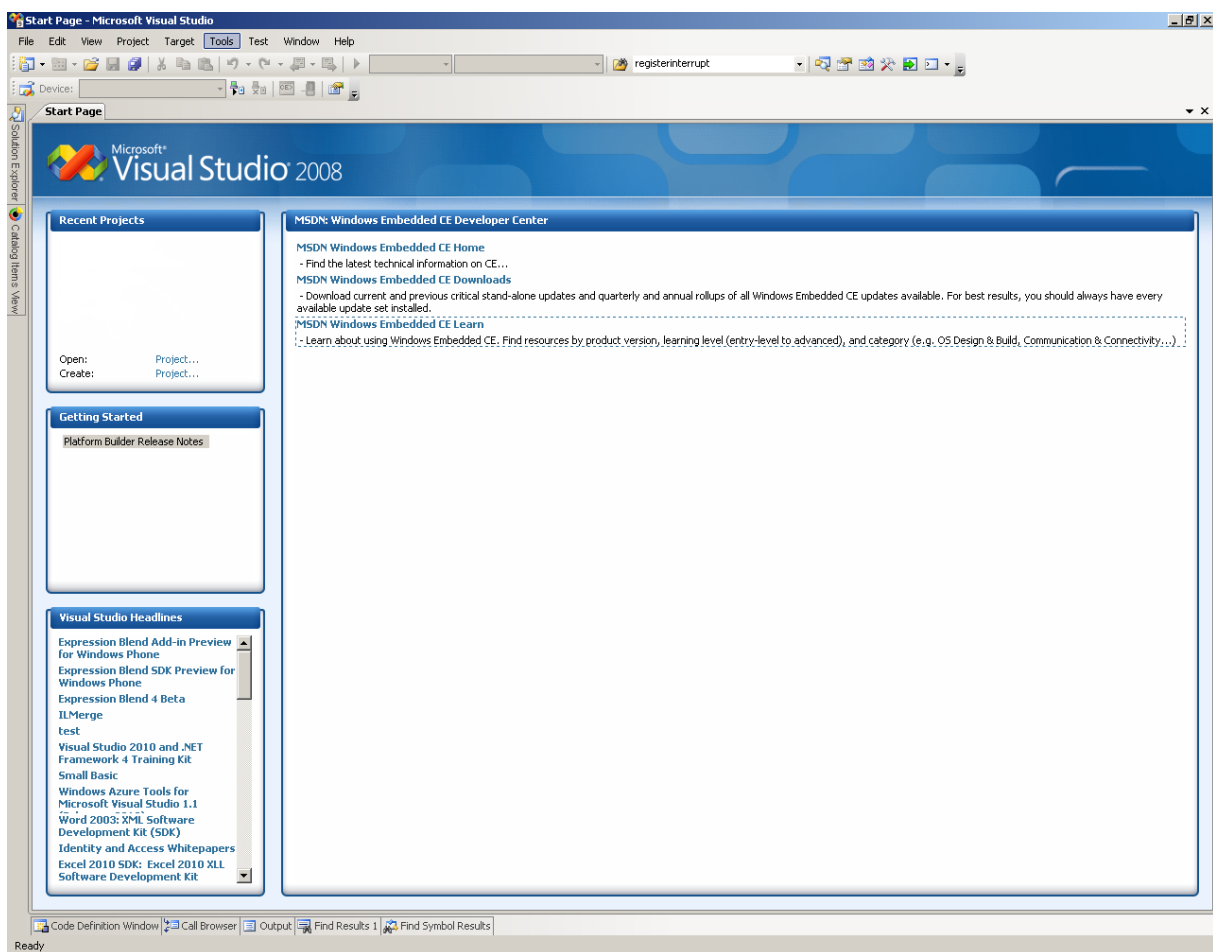
The program has now been copied to your phyCORE-OMAP44xx device. You will be able to access it by double-clicking the *My Device* icon on your phyCORE-OMAP44xx device. This opens a window that will show you the file structure of your device. You should be able to find *HelloWorld.exe* at the location you copied it to. Double-click it to execute the program. A window will open on your phyCORE-OMAP44xx device that will print a *Hello World* message.

2.8 Downloading Example Code with Visual Studio 2008

PHYTEC provides you with example code to learn about downloading code onto your phyCORE-OMAP44xx device. This code has already been copied to your local hard drive by the setup.

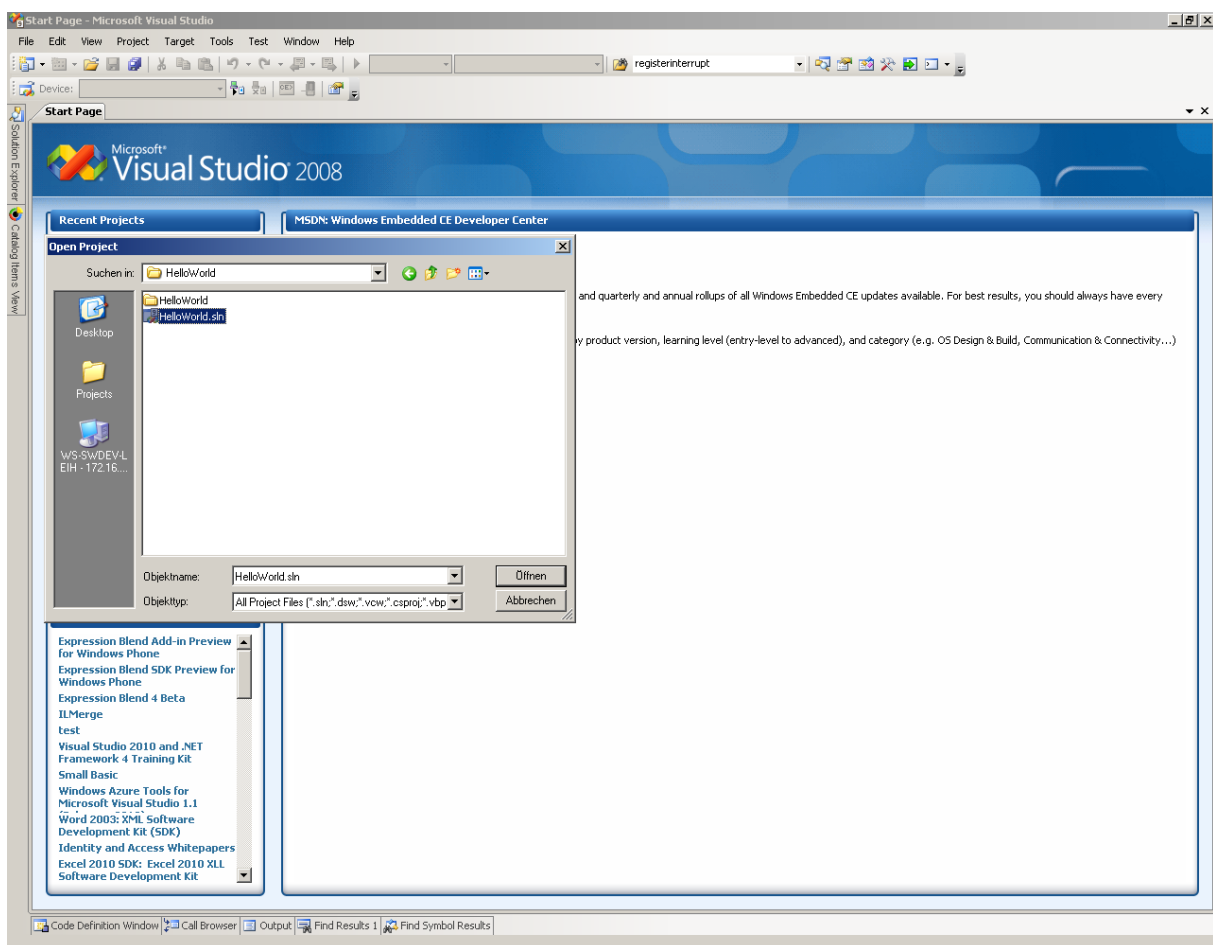
Start the tool chain by selecting *Microsoft Visual Studio 2008* from the programs group: *Start / Programs / Microsoft Visual Studio 2008*.

After starting Visual Studio 2008 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 *File / Close Solution*.

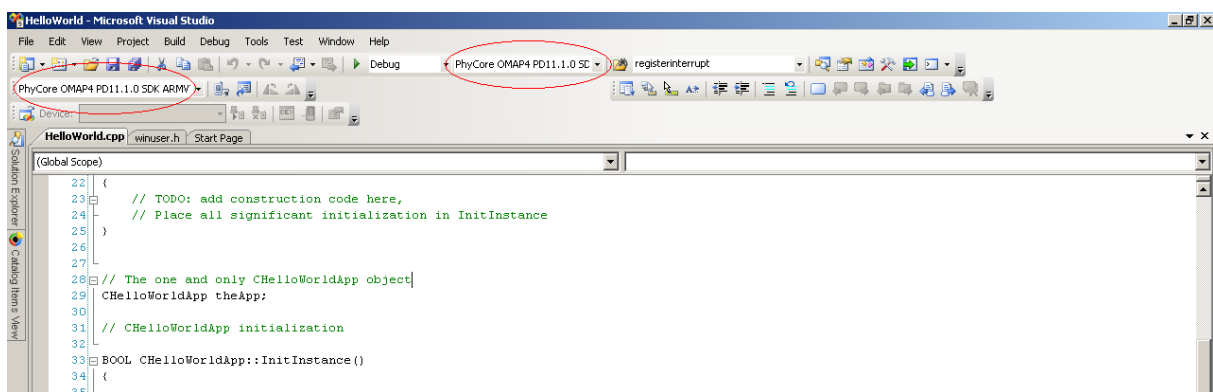


The *HelloWorld* example downloads a program to your device that, when executed, prints the text *Hello World* on the display of your phyCORE[®]-OMAP44xx.

- To open the *HelloWorld* project select *File / Open / Project/Solution...* from the Visual Studio 2008 menu bar.
- Browse to the folder
`C:\PHYTEC\PCM049_phyCORE-OMAP44xx\WinCE-Kit\QuickStart\Demos`
`\Demo\HelloWorld.`
- Select the *HelloWorld* project *HelloWorld*.




- Click *Open*.
- In the **Solution Platform** pull-down menu make sure that the *PhyCore OMAP4 PD11.1.0 SDK (ARMv4I)* configuration is selected. Also make sure that *PhyCore OMAP4 PD11.1.0 SDK ARMV7 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 phyCORE-OMAP44xx device. For this to work you need to have established an Active Sync connection between your PC and your phyCORE-OMAP44xx 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 phyCORE-OMAP44xx device. To start it select *My Device* on the target platform, go to the folder *Program Files / HelloWorld* and double tap on “HelloWorld”.
- A window with one button will open on your phyCORE-OMAP44xx device. Click on the button to print the Hello World message on a listbox.
- Click 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

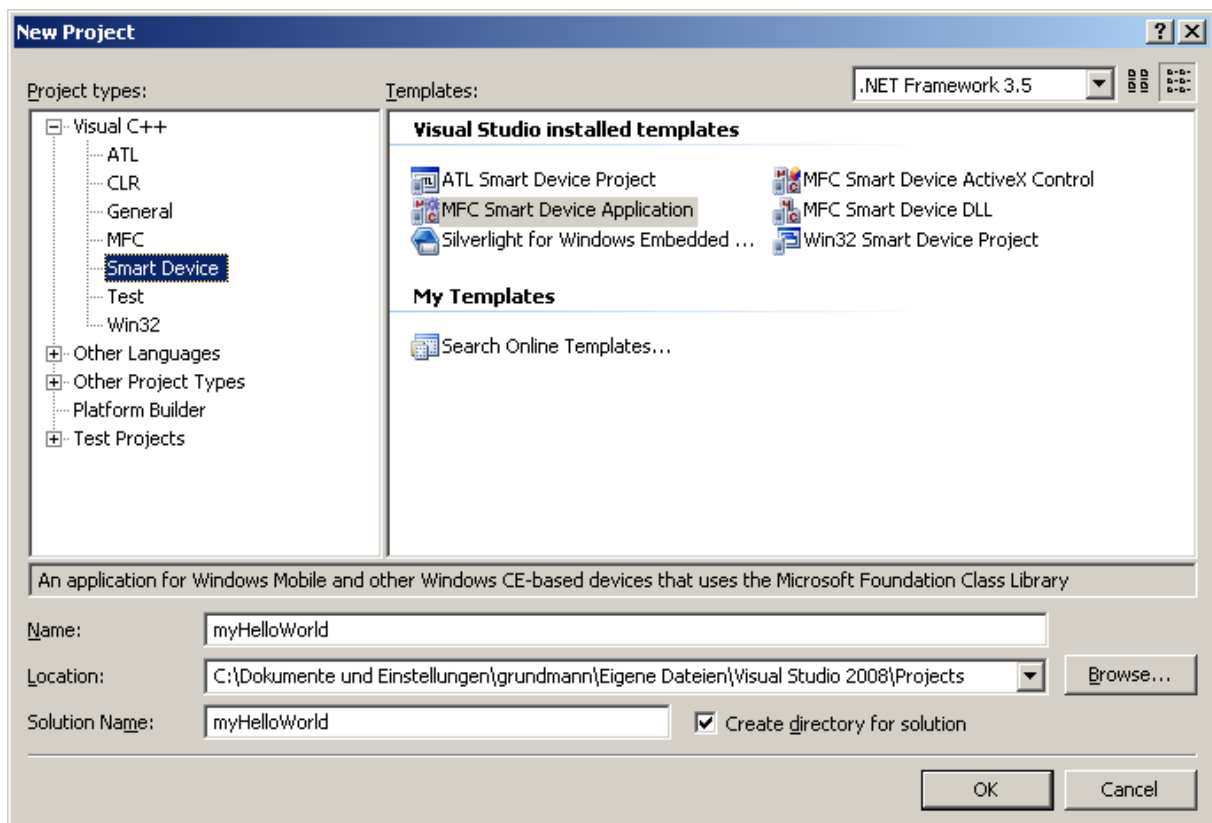


30 min

In this chapter you will learn how to configure the Visual Studio 2008 IDE (Integrated Development Environment), create a new MFC application, which will print a Hello World message on the serial interface, and build and download a machine-readable output file to the target hardware.

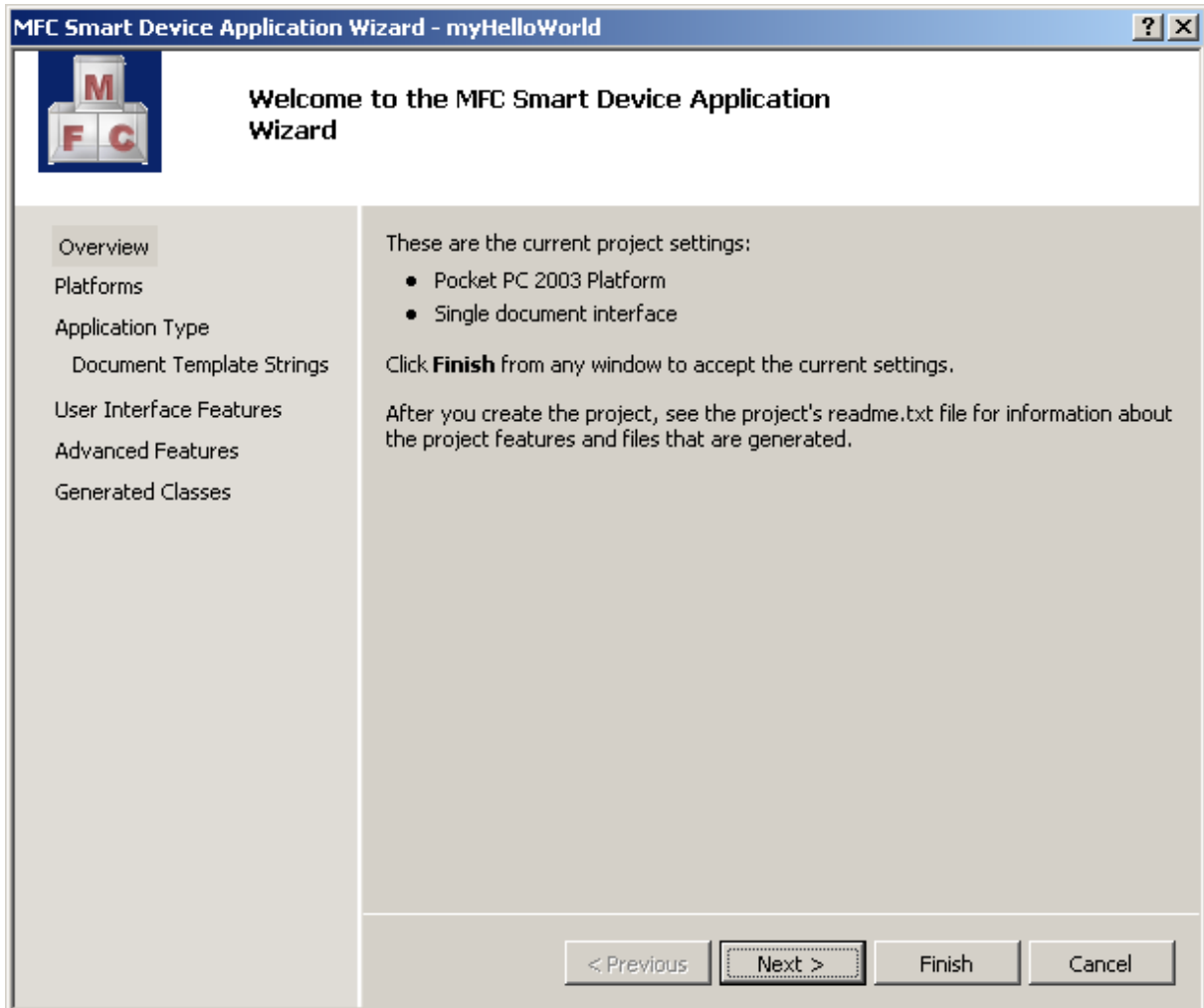
3.1 Creating a New Project

- To create a new project file select *File / New / Project...* from the Visual Studio 2008 menu. This opens a dialog that will ask about the kind of project you wish to create.

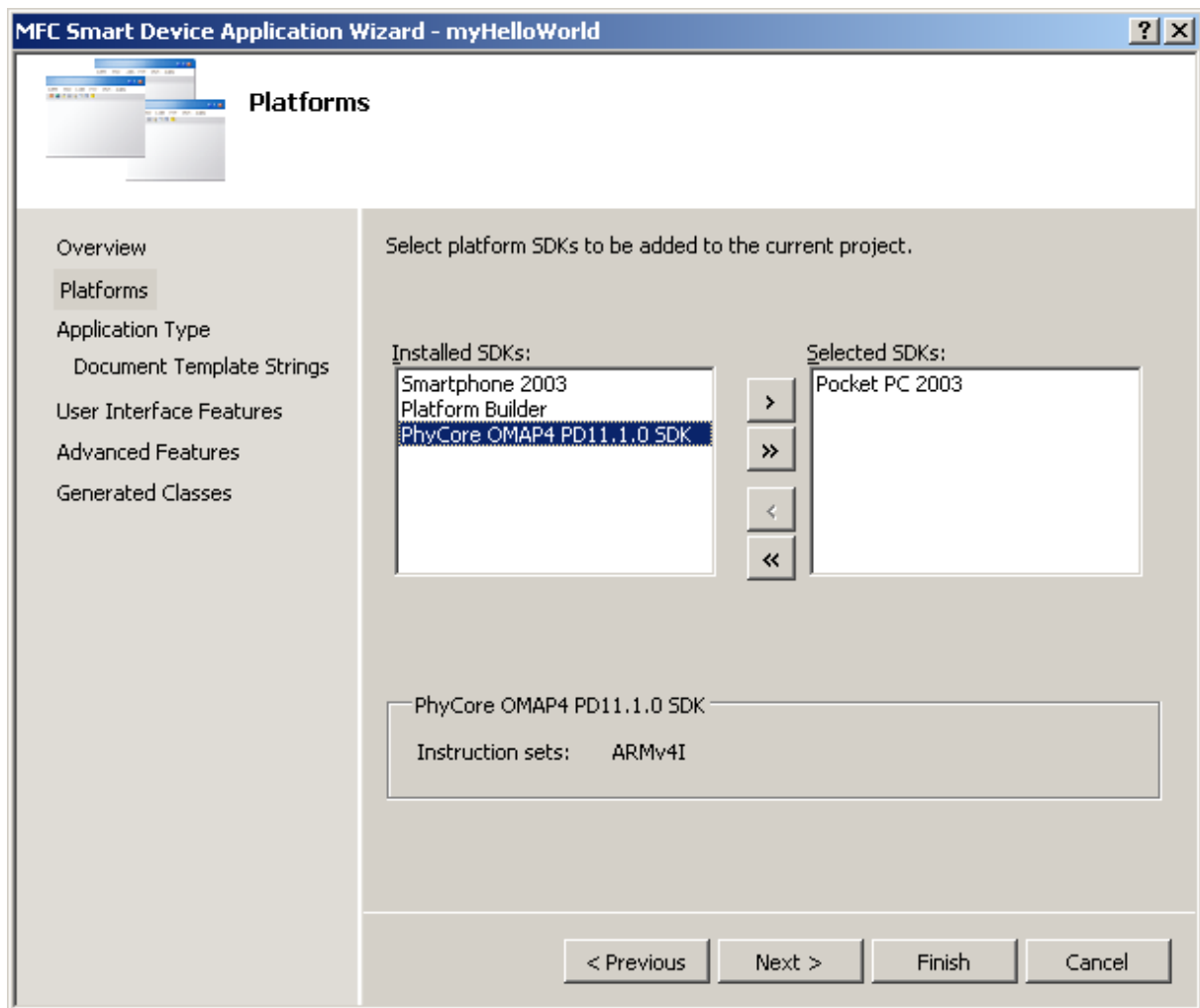


- Open the Visual C++ tree and select *Smart Device*.
- In the Templates field select *MFC Smart Device Application*.

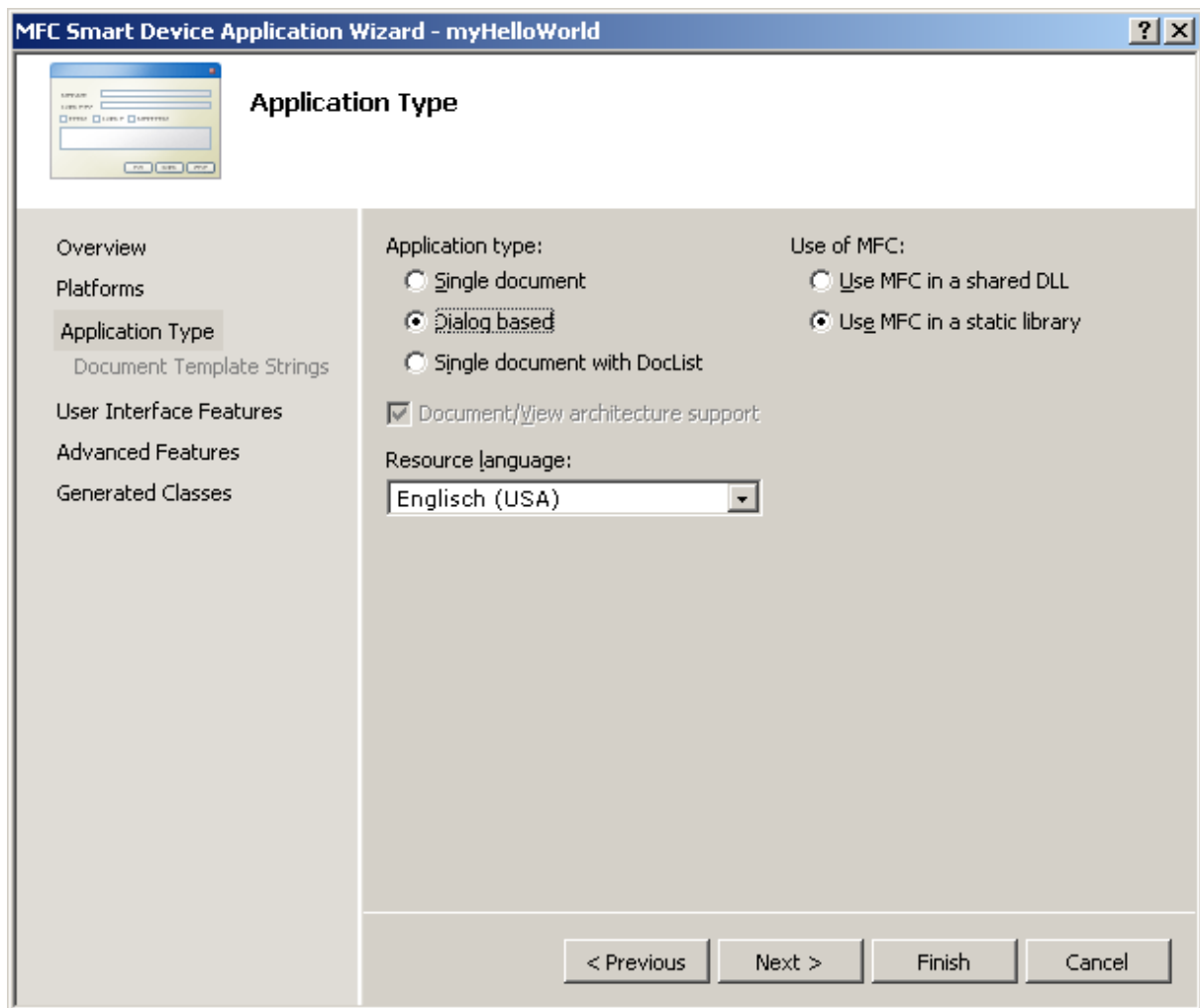
- In the text field Name, enter the name of the project you wish to create, e.g. *myHelloWorld*.
- Click *OK*.



- Click *Next*.



- Click the entry *PhyCore OMAP4 PD11.1.0 SDK* in the field *Installed SDKs:* and click the > button. The *PhyCore OMAP4 PD11.1.0 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.
- Click *Next >*

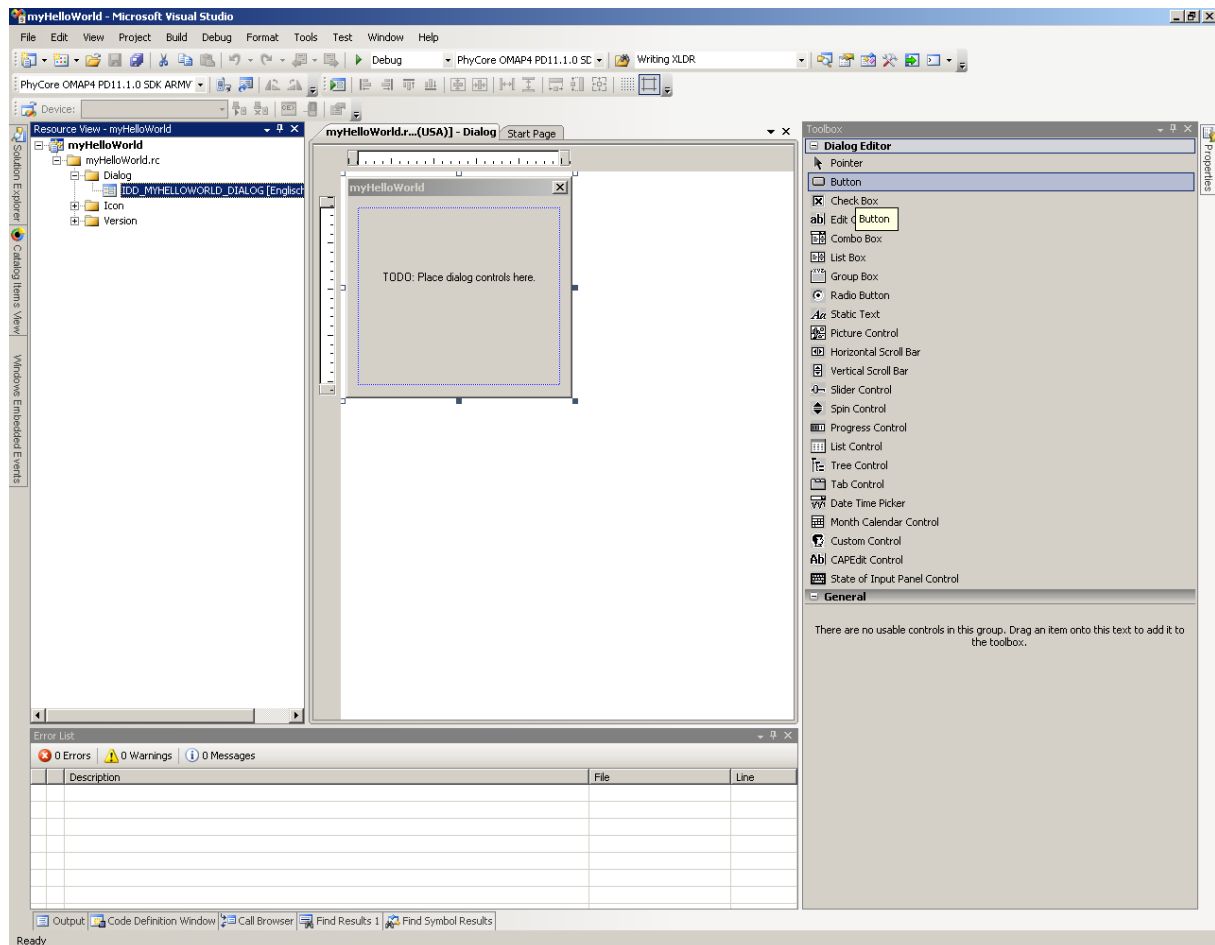


- Select *Dialog based* and press *Finish*.

At this point you have created a new project for the phyCORE-OMAP44xx board. The next step is to modify the C source file before building your project. This includes compiling, linking, locating and creating the executable.

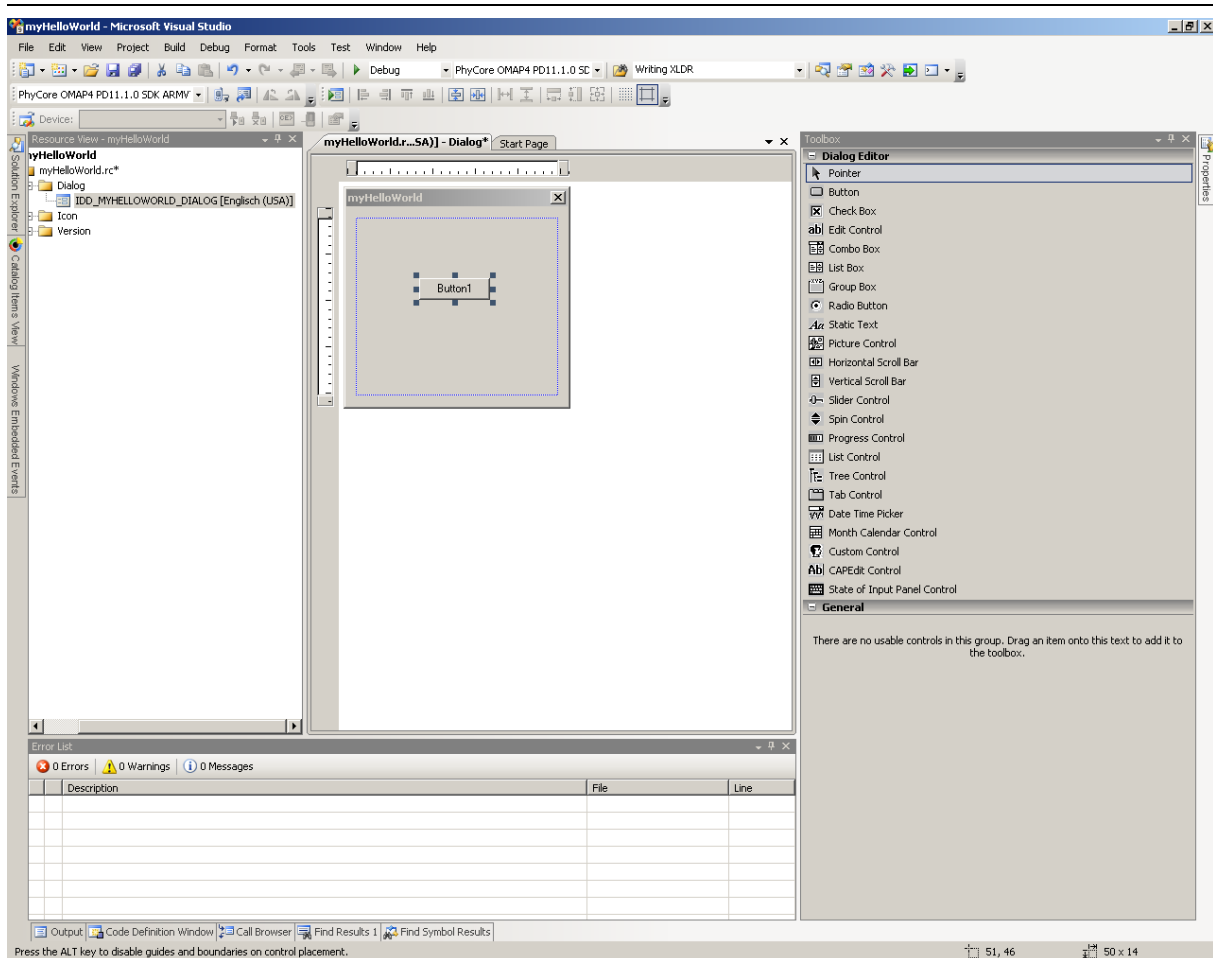
3.2 Create a Button on dialog

Expand *Resource Files* at the Solution Explorer on the left side. Double-click on *myHelloWorld.rc* for opening the *Resource View* window. Expand the *Dialog* folder and double-click the *IDD_MYHELLOWORLD_DIALOG*. Now your development-view have to look like the following.

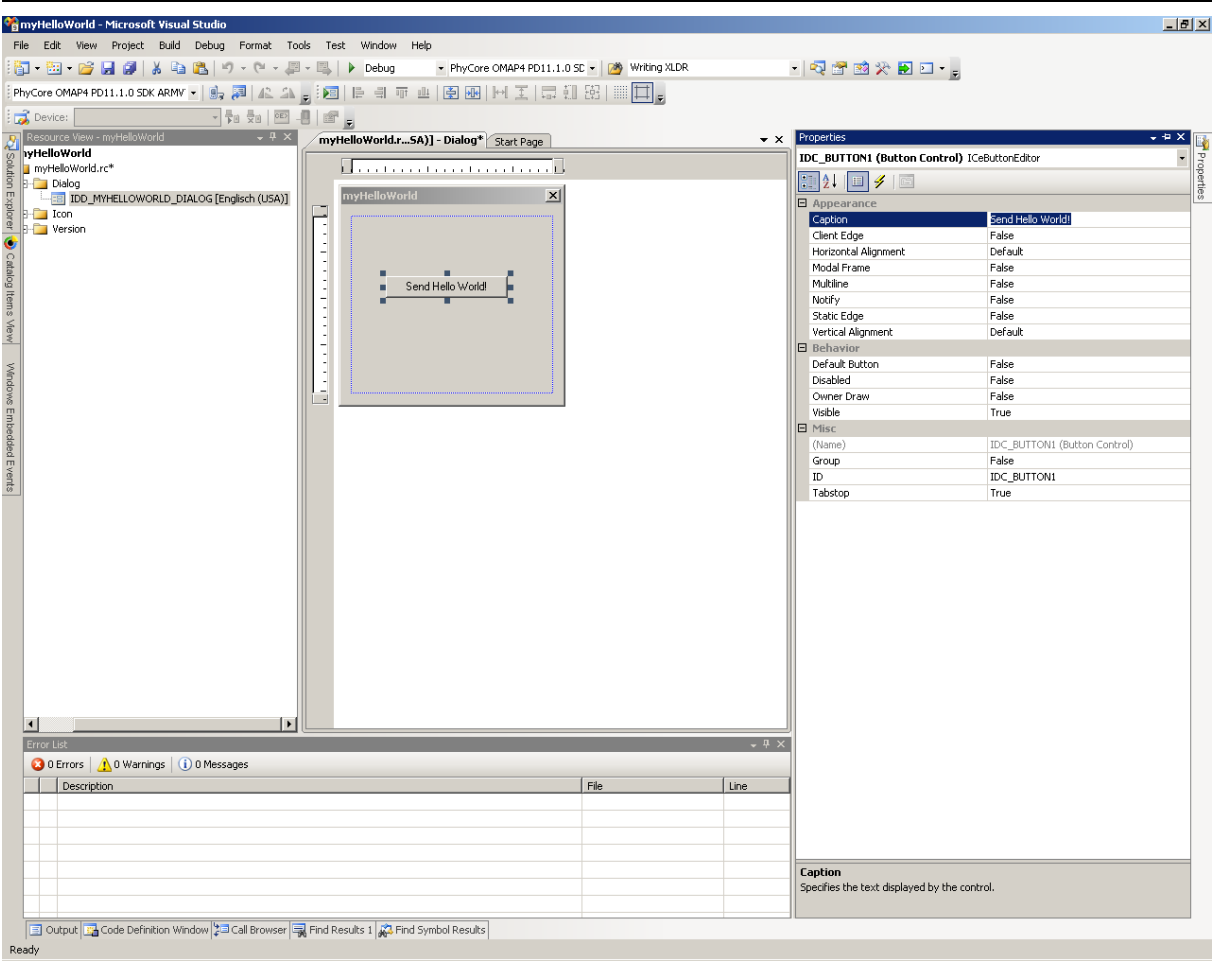


Before we start, select the “TODO: Place dialog controls here” text on the dialog window and delete it.

Have a look at the *Toolbox* window on the right. You can drag and drop any control field in your dialog window *myHelloWorld*. For our example we need only one button. Select the *Button* tool in the toolbox and drag it on your dialog window like below.



To edit the button caption do right-click on the button and select “Properties”. On the properties window edit the “Caption” field in “Send Hello World”.



3.3 Modifying the Source Code

Double-Click on the created button. Visual Studio automatically adds the function for the button. Copy the following code in the `void CmyHelloWorldDlg::OnBnClickedButton1()` function:

```
CString sCom;
HANDLE hComPort;
DCB dcb;
DWORD err = 0;

// name of serial interface, getting from platform.reg
sCom = "COM2:";

// open COM-Port for communication
hComPort = CreateFile ( sCom,
    GENERIC_WRITE | GENERIC_READ,
    0,
    NULL,
    OPEN_EXISTING,
    0,
    NULL);

if(!hComPort)return;

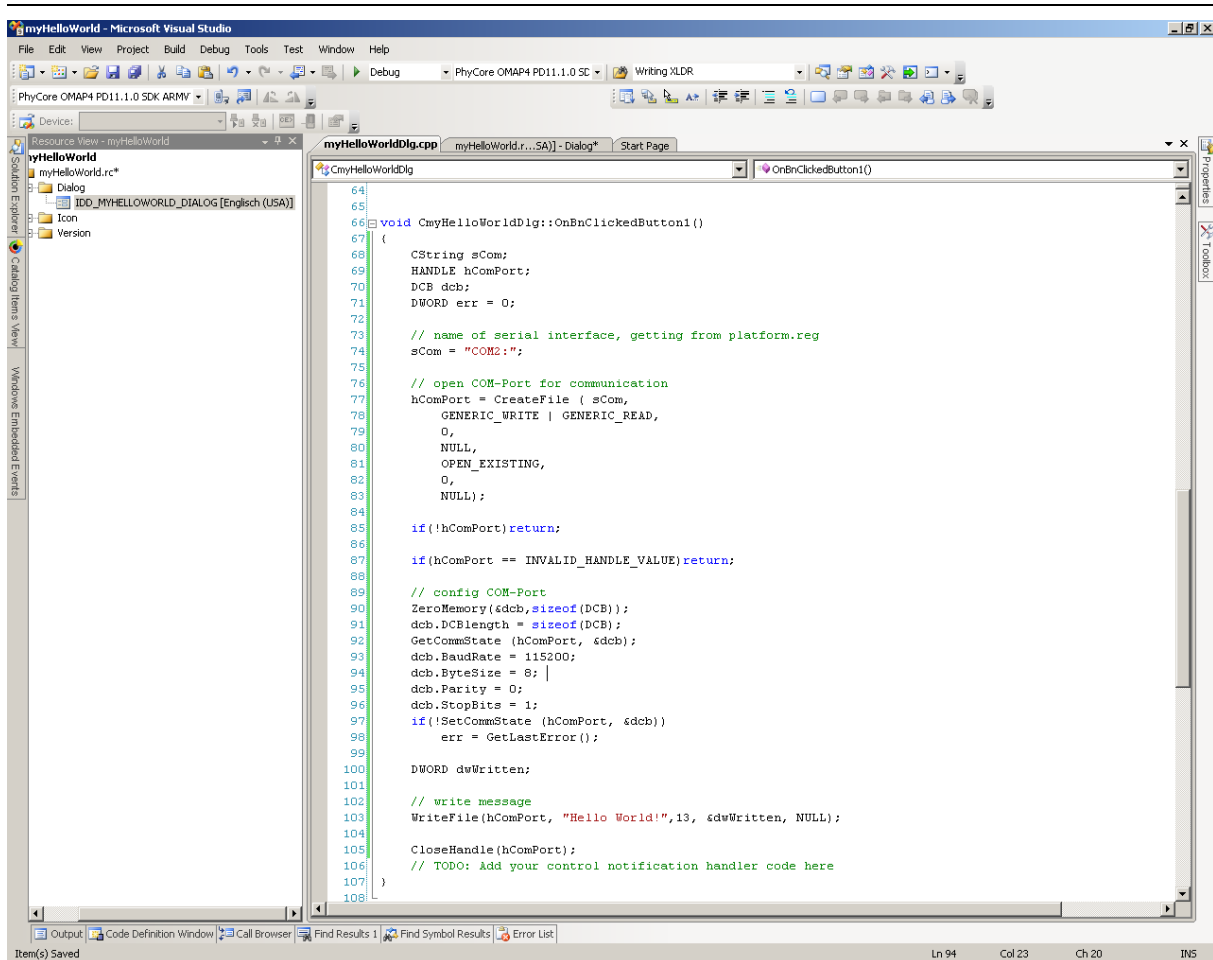
if(hComPort == INVALID_HANDLE_VALUE)return;


// config COM-Port
ZeroMemory(&dcb, sizeof(DCB));
dcb.DCBlength = sizeof(DCB);
GetCommState (hComPort, &dcb);
dcb.BaudRate = 115200;
dcb.ByteSize = 8;
dcb.Parity = 0;
dcb.StopBits = 1;
if(!SetCommState (hComPort, &dcb))
    err = GetLastError();

DWORD dwWritten;

// write message
WriteFile(hComPort, "Hello World!",13, &dwWritten, NULL);


CloseHandle(hComPort);
```



Save the modified file by choosing *File / Save* or by clicking the *save icon* .

3.4 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 phyCORE-OMAP44xx device. For this to work you need to have established an Active Sync connection between your PC and your phyCORE-OMAP44xx device as

described in section 2.6. When the connection is established select *Build / Deploy myHelloWorld* 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 phyCORE-OMAP44xx device. To start it select *My Device* on the target platform and go to the folder *Program Files / myHelloWorld* and double tap on “myHelloWorld”.
- Please connect the UART2 (bottom P1) to your computer and open the HyperTerminal or any other terminal program. Set the configuration like following:

Baudrate:	115200
Databits:	8
Parity:	None
Stopbits:	1

- Click on the “Send Hello World!” button and look at the terminal program for the “Hello World!” message.



SUCCESS

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 2008. 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 *myHelloWorldDlg.cpp* file to open the file in the source code editor.
- Locate the following code section

```
// write message
WriteFile(hComPort, "Hello World!",13, &dwWritten, NULL);
```

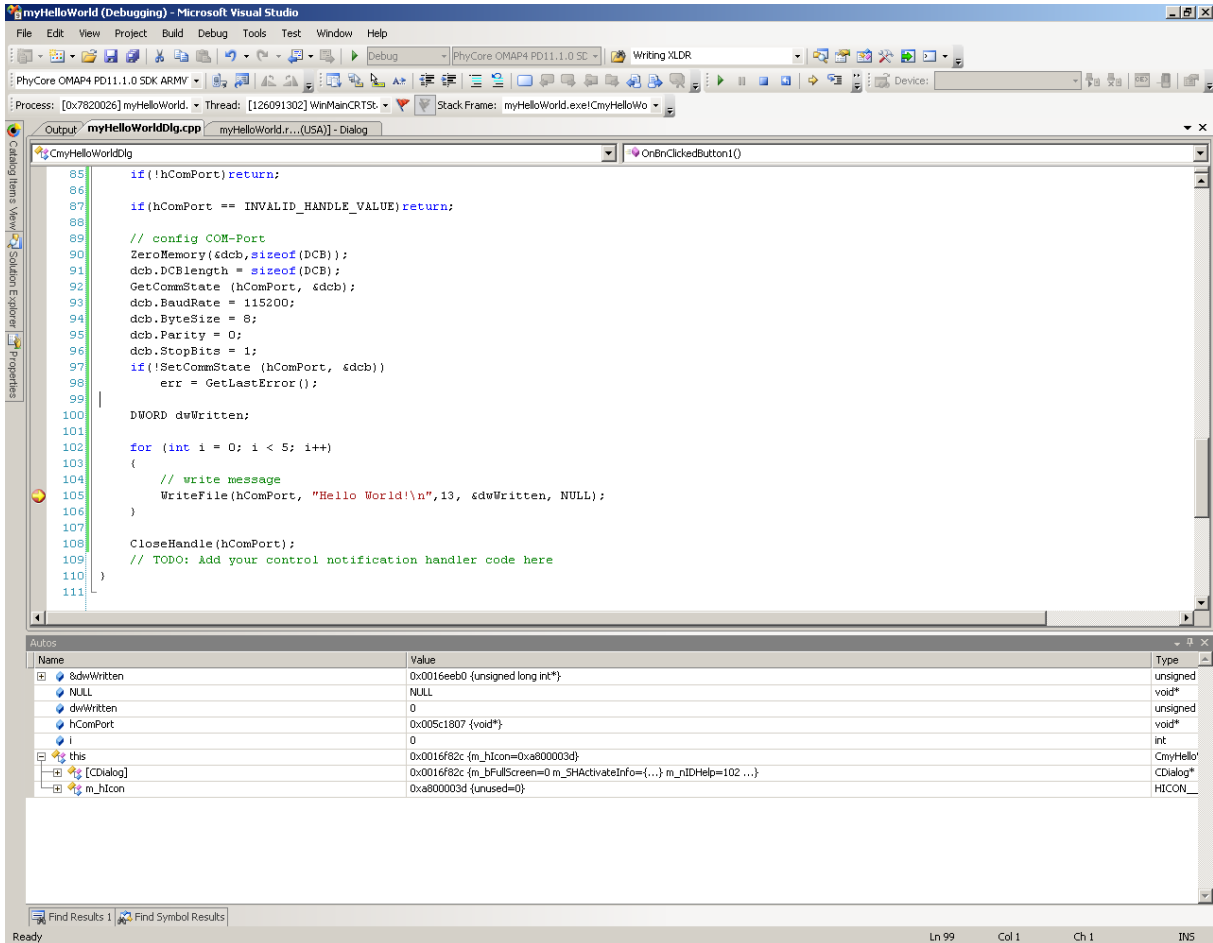
- Edit the line like this

```
for (int i = 0; i < 5; i++)
{
    // write message
    WriteFile(hComPort, "Hello World!\n",13, &dwWritten, NULL);
}
```

- Position the cursor on the “WriteFile” function.
- 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 2008, 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 phyCORE-OMAP44xx 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 2008 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 2008 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.

Name	Value
&dwWritten	0x0016eeb0 {unsigned long int*}
NULL	NULL
dwWritten	0
hComPort	0x005c1807 {void*}
i	0
this	0x0016f82c {m_hIcon=0xa800003d}
[CDialog]	0x0016f82c {m_bFullScreen=0 m_SHActivateInfo={...} m_nIDHelp=102 ...}
m_hIcon	0xa800003d {unused=0}

- 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.
- To run your program without stopping at any time, delete all breakpoints by clicking on the *Insert / Remove Breakpoint* icon.
- Click the *Go*  button.
- You can use the *Stop Debugging*  button to stop program execution at any time.

4.4 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[®]-OMAP44xx.

- 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.

You can now watch your final example on the screen of your phyCORE-OMAP44xx 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 phyCORE-OMAP44xx. 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 phyCORE-OMAP44xx WinCE-Kit CD, which is already installed on your system.

- Open Visual Studio 2008, if not already open.
- To open the project select *File / Open / Project/Solution...* from the Visual Studio 2008 menu bar.
- Browse to the folder *C:\WINCE600\OSDesigns\OMAP4Phytec* and select the project *OMAP4Phytec*.

When the project is loaded you will see the project in the *Solution Explorer* Tab in the left window. If a dialog “Missing Catalog Items in OS Design” appears, just press *Cancel*.

Open the Tree *OMAP4Phytec\Parameter Files\OMAP4Phytec: ARMV7 (Active)* and double click on *project.bib*. Under the “Files” section add the following line:

```
HelloWorld.exe "C:\PHYTEC\PCM049_phyCORE-OMAP44xx\WinCE-Kit\QuickStart\Demos\Demo\HelloWorld\HelloWorld\Phytec phyCORE-OMAP44xx SDK (ARMV4I)\Debug\HelloWorld.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 2008 menu bar. The build process will take about 20 minutes, depending on your host platform hardware.



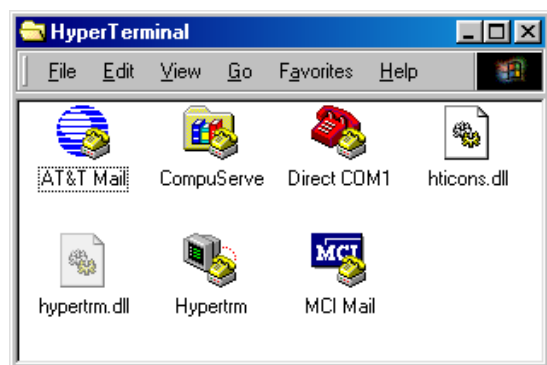
You don't have always to do a complete build process that takes this long. If you just want to add a file to the image like in the example before, you can do this by selecting *Build / Copy Files to Release Directory*. This copies all necessary files to the *Release* directory. Then you can build the image with *Build / Make Run-Time Image*. This takes only about 1 minute. Please refer to the Visual Studio 2008/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.

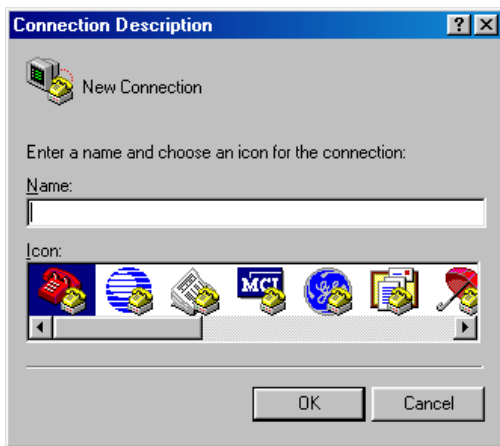
Start the HyperTerminal program within the *Programs / Accessories* bar.

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.

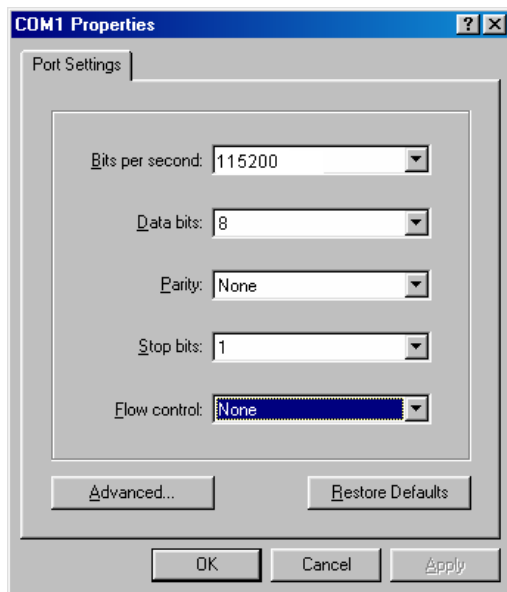


Next click *OK*. This creates a new HyperTerminal session named “COM Direct” and advances you to the next HyperTerminal window.



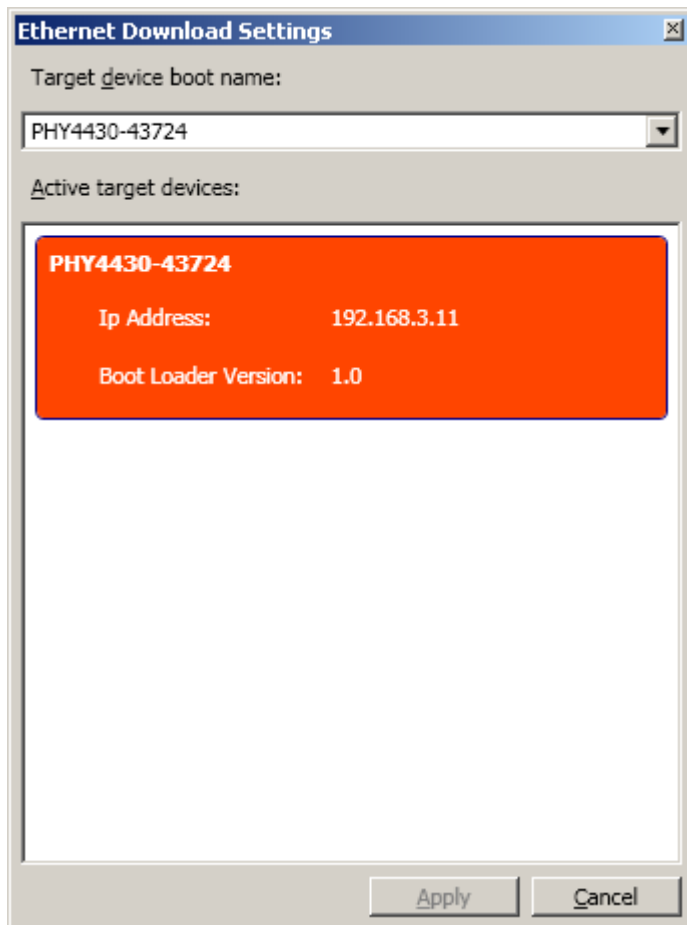
The *COM Direct Properties* window will now appear. Specify *Direct to COM1/COM2* under the *Connect Using* pull-down menu (be sure to indicate the correct COM setting for your system).

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 (connector P1) 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 Ethernet connector on the target and the right network card of your host.
- Press '4' for submenu *Network Settings*. Press '6' to change the IP address of the device and '7' to change the network mask. Change the default settings so it will fit to the network settings on your PC.
- Press '5' to disable DHCP.
- Press '0' to go back to main menu.
- Press '2' for *Select Boot Device* and then choose '1' for *LAN9115 MAC*.
- Press '7' to save the configuration.
- Press '0' for start downloading the image. You will see some output messages followed by a BOOTME message.
- Select *Target Attach Device...* from the Visual Studio 2008 menu bar.

- Following windows should appear:

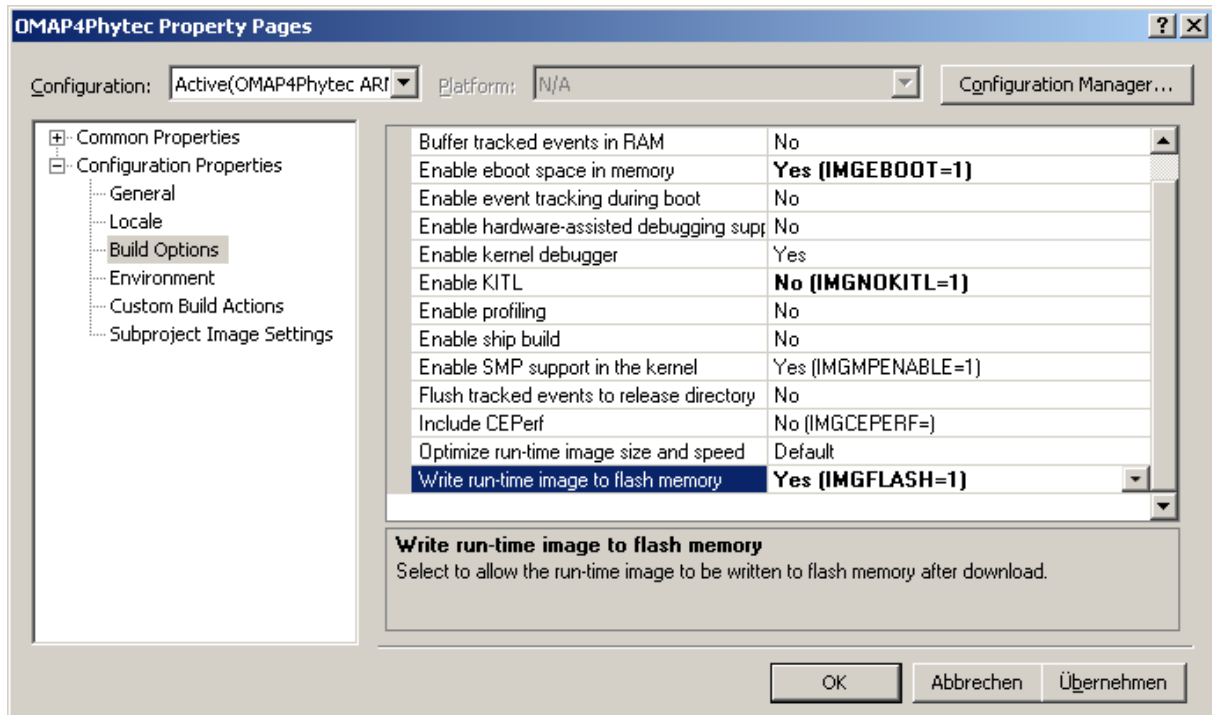


- Select the *PHY4430* device and exit by clicking “Apply”.
- A download message with a status bar should appear and the download should start.
- When the download is finished, the image should start. Calibrate the touch panel, then navigate to the folder *MyDevice\Windows*. There you find your HelloWorld application that can be executed.

In this example the image that was build is a RAM image.

- Reset the device and press space to stop the bootloader.
- Press ‘2’ for *Select Boot Device* and then choose ‘3’ for *NK from NAND*.
- Press ‘7’ to save the configuration.
- Press ‘0’ and the original image from flash will be started again.

To build an image that can be stored in flash, select *Project -> OMAP4Phytec Properties...* in the Visual Studio 2008. On the *OMAP4Phytec Property Pages* expand *Configuration Properties* and select *Build Options*. Edit the “Write run-time image to flash” option to “Yes (IMGFLASH=1)”.



Click “OK” and select *Build -> Make run-time image* in Visual Studio. Please read Appendix A “How to install Windows Embedded Compact on the phyCORE-OMAP44xx” for information 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[®]-OMAP44xx 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[®]-OMAP44xx using Visual Studio 2008.

The *Debugging* part of this QuickStart gave you information on setting up and using the debugger with Visual Studio 2008. You learned how to set breakpoints, watching and changing variables content.

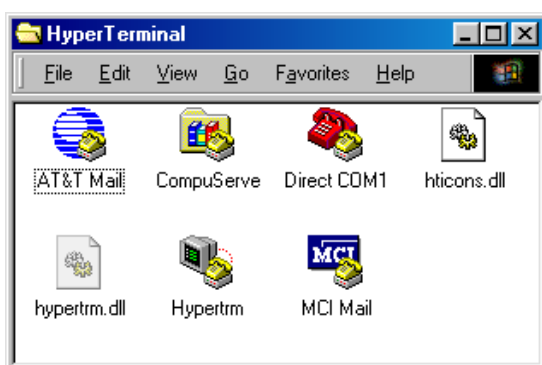
In the *Building an Image* section you learned how to build a new image based on a preconfigured BSP and project.

Appendix A How to install Windows Embedded Compact on the phyCORE-OMAP44xx Kit

In this section will be described how to download Windows Embedded Compact on your device.

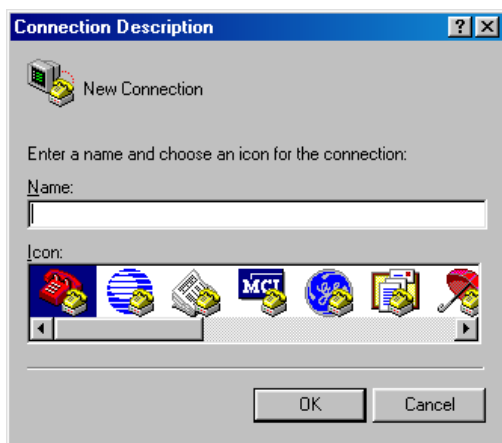
Start the HyperTerminal program within the *Programs / Accessories* bar.

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.

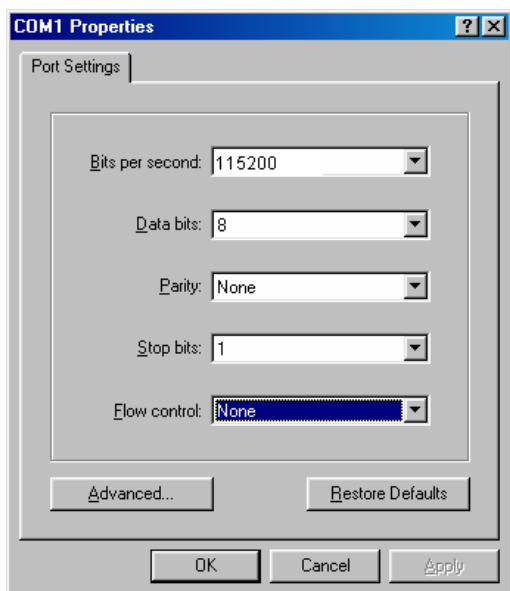


Next click *OK*. This creates a new HyperTerminal session named “COM Direct” and advances you to the next HyperTerminal window.



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*).

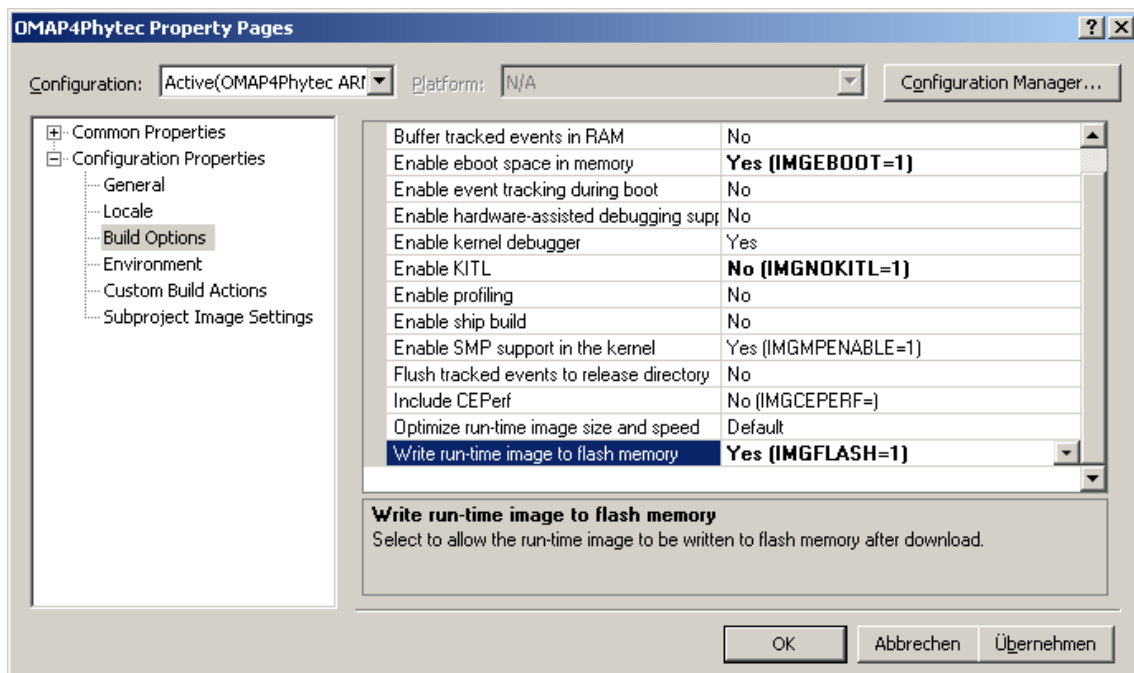


- Set the following COM parameters: Bits per second = 115200; Data bits = 8; Parity = *None*; Stop Bits = 1; Flow Control = *None*.

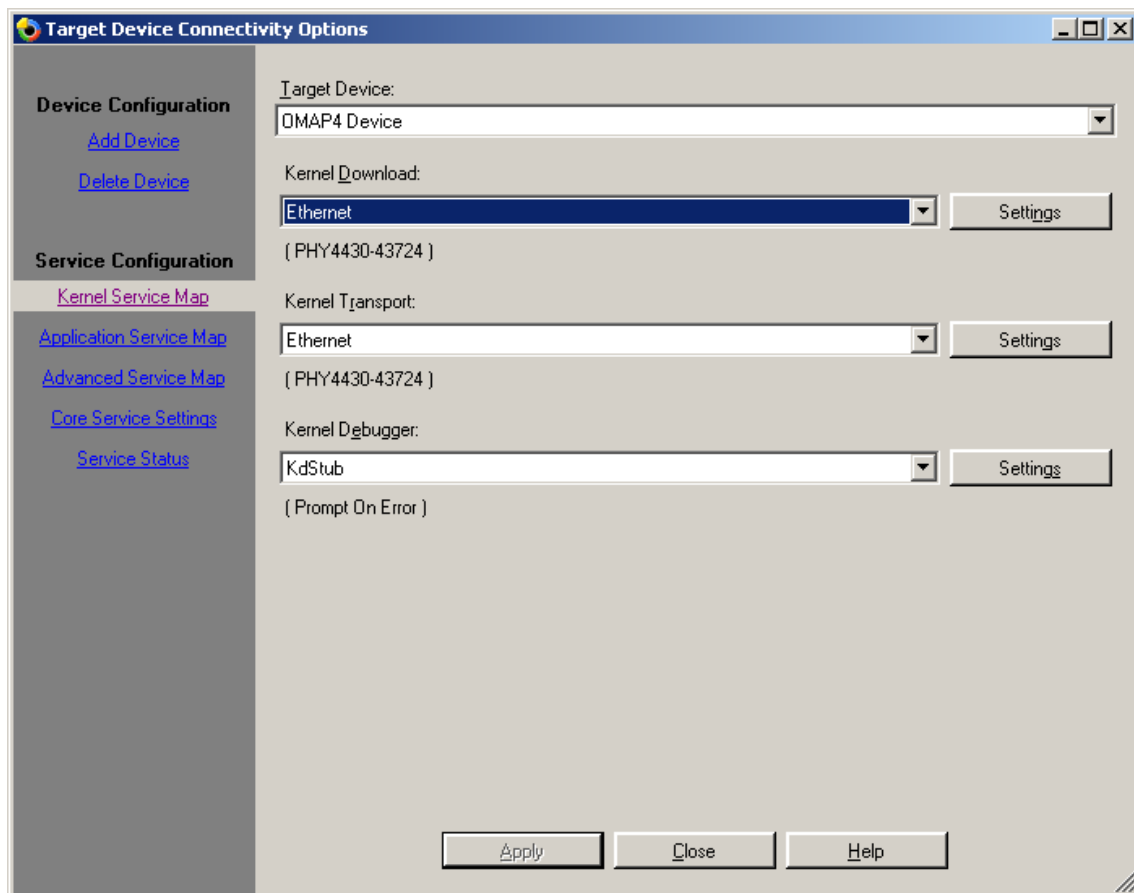
- Selecting *OK* advances you to the *COM Direct-HyperTerminal* monitoring window. Notice the connection status report in the lower left corner of the window.

Downloading WEC7 image

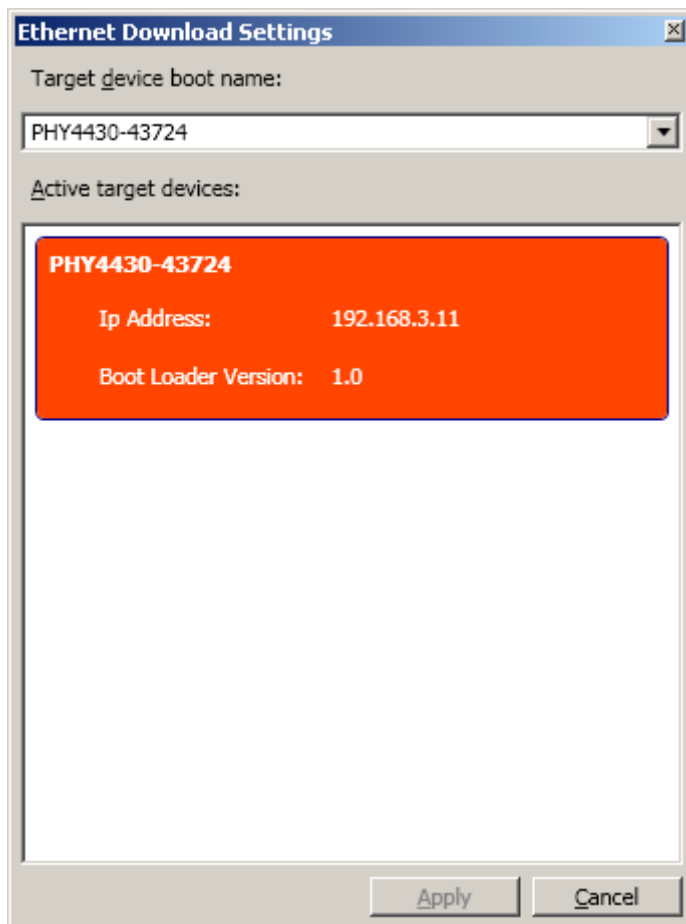
- Connect the UART (connector P1) to the computer.
- Power up the baseboard.
- You will now see some output messages from the bootloader in the HyperTerminal window. Press space to stop the bootloader.
- Connect the cross-over Ethernet cable with the Ethernet connector on the target and the right network card of your host.
- Press '4' for submenu *Network Settings*. Press '6' to change the IP address of the device and '7' to change the network mask. Change the default settings so it will fit to the network settings on your PC.
- Press '5' to disable DHCP.
- Press '0' to go back to main menu.
- Press '2' for *Select Boot Device* and then choose '1' for *LAN9115 MAC*.
- Press '7' to save the configuration.
- Start Microsoft Visual Studio 2008 and open the OSDesign Project *OMAP4Phytec*. You have two options to generate a WEC7 image. First one is a RAM image, which only can download and execute in RAM. Second one is a persistent flash image that will be programmed in NAND flash.
- Open the *Project -> OMAP4Phytec Properties* in Visual Studio.
- The window *OMAP4Phytec Property Pages* appear. Expand *Configuration Properties* and select *Build Options* on the tree.



- If you would like build a flash image, you have to set the option *Write run-time image to flash memory* to **YES (IMGFLASH = 1)**. Otherwise you have to set these options to **NO**. Apply your settings with **OK**.
- If you had build the OSDesign already, select *Build* → *Make Run-Time Image* in the Visual Studio menu, otherwise select *Build* → *Build OMAP4Phytec*.
- After build select *Target / Connectivity Options...* from the Visual Studio 2008 menu bar.
- Select *OMAP4 Device* in the *Target Device* drop down box.
- Select *Ethernet* in the *Kernel Download* and *Kernel Transport* settings.



- Click *Settings* beside the *Kernel Download* Drop down box to open the *Ethernet Download Settings* window.
- Change to the HyperTerminal window and press '0' ("Exit and Continue") 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 by pressing *Apply* in the first window and *Apply* and *Close* in the second one.



- After download process the RAM image will be directly execute in RAM. If you have build a FLASH image it will be programmed in flash after download process and execute when it is finished.

But don't forget that the bootloader still is set for booting from Ethernet! Thus, after a reset you'll get BOOTME messages again instead of having WinCE being booted.

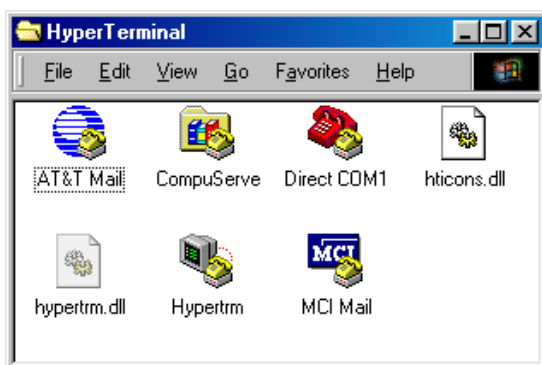
- Reset the device and press space to stop the bootloader.
- Press '2' for *Select Boot Device* and then choose '7' for *NK from NAND*.
- Press '7' to save the configuration.
- Press '0'. Booting will now always be done from flash again.

Appendix B How to update an existing bootloader on the phyCORE-OMAP44xx Kit

In this section will be described how to update the bootloaders over Ethernet. If you got a Linux Embedded Kit and would like to replace the linux bootloader, please contact the support.

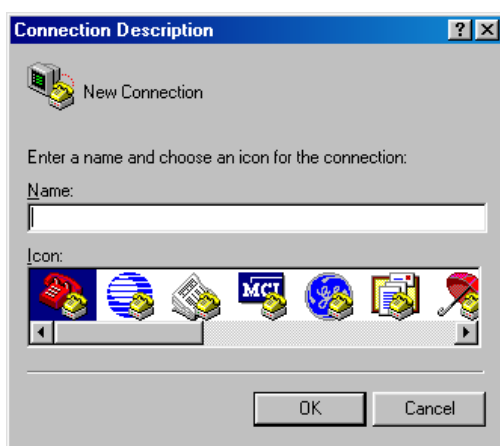
Start the HyperTerminal program within the *Programs / Accessories* bar.

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.

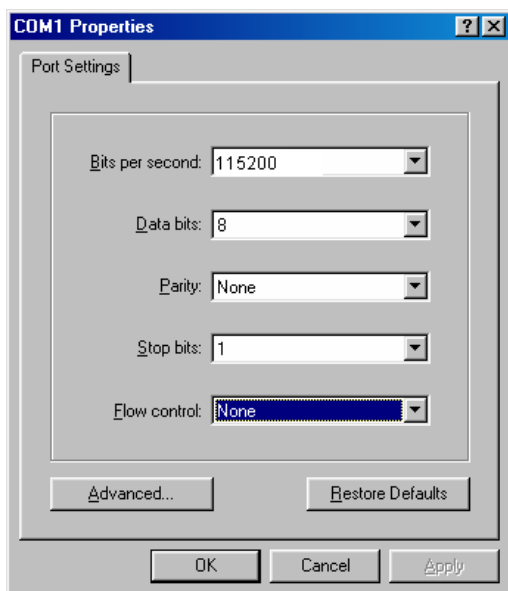


Next click *OK*. This creates a new HyperTerminal session named “COM Direct” and advances you to the next HyperTerminal window.



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*).

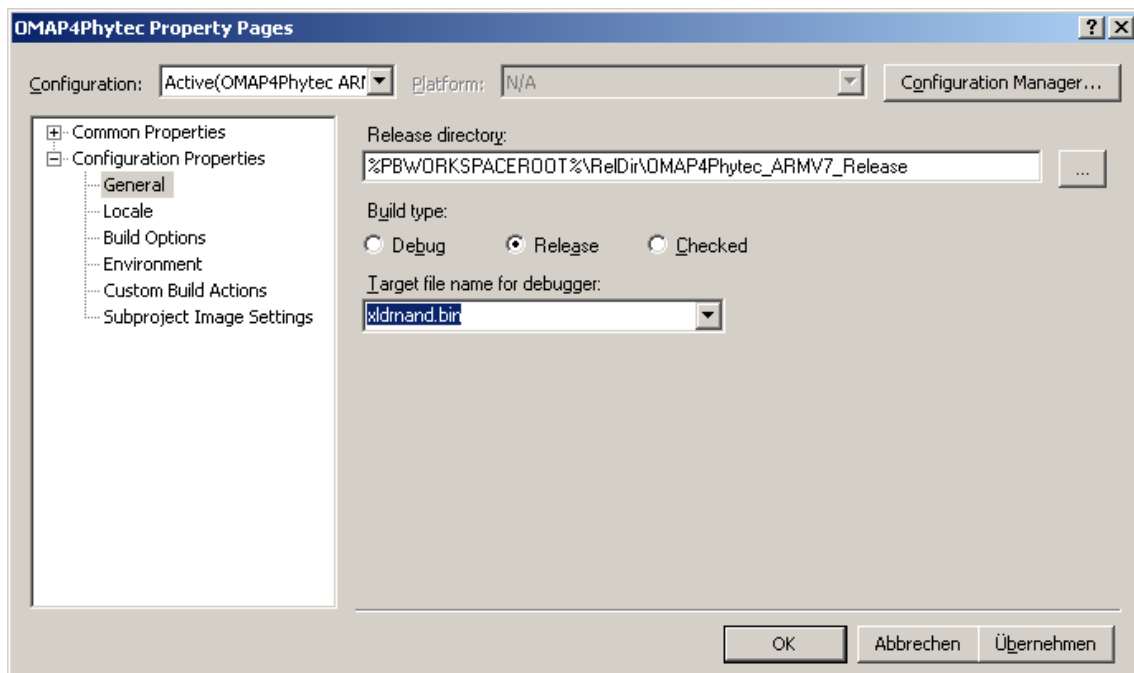


- Set the following COM parameters: Bits per second = 115200; Data bits = 8; Parity = *None*; Stop Bits = 1; Flow Control = *None*.

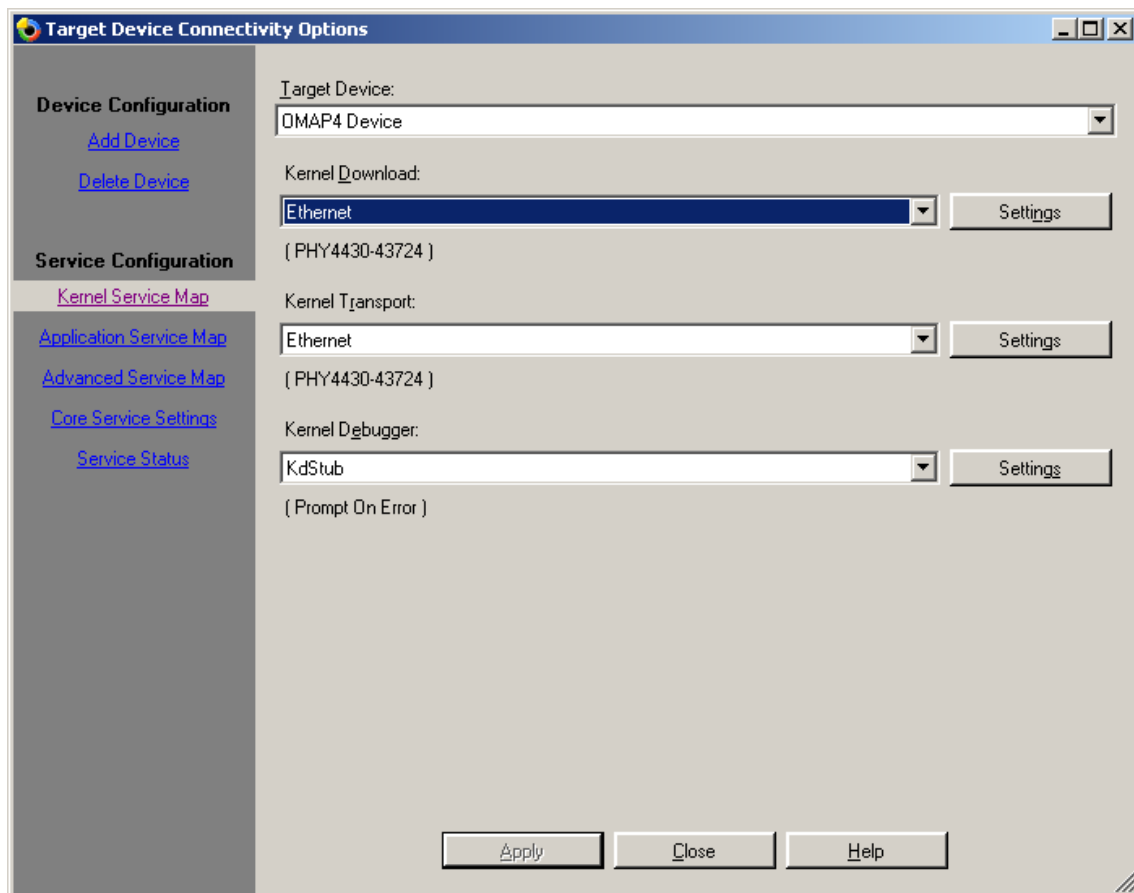
-
- Selecting *OK* advances you to the *COM Direct–HyperTerminal* monitoring window. Notice the connection status report in the lower left corner of the window.

Updating the bootloader

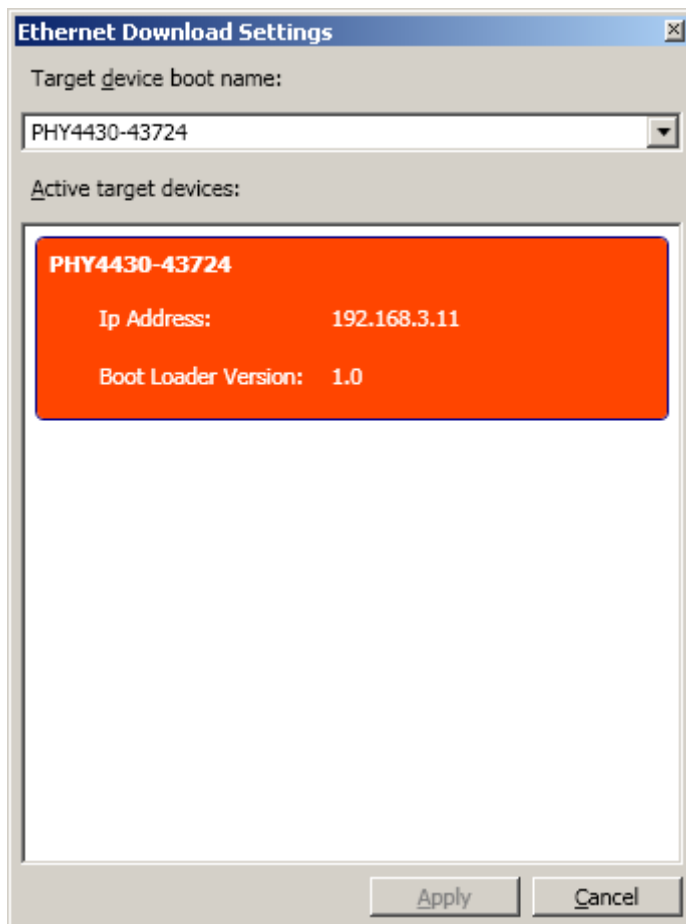
- Connect the UART (connector P1) to the computer.
- Power up the baseboard.
- You will now see some output messages from the bootloader in the HyperTerminal window. Press space to stop the bootloader.
- Connect the cross-over Ethernet cable with the Ethernet connector on the target and the right network card of your host.
- Press '4' for submenu *Network Settings*. Press '6' to change the IP address of the device and '7' to change the network mask. Change the default settings so it will fit to the network settings on your PC.
- Press '5' to disable DHCP.
- Press '0' to go back to main menu.
- Press '2' for *Select Boot Device* and then choose '1' for *LAN9115 MAC*.
- Press '7' to save the configuration.
- Start Microsoft Visual Studio 2008 and open the OSDesign Project *OMAP4Phytec*. If you don't have build the project select *Build OMAP4Phytec* on the Build menu in Visual Studio.
- After build process select *Project-> OMAP4Phytec Properties* on the Visual Studio menu.
- The window *OMAP4Phytec Property Pages* appear. Expand *Configuration Properties* and select *General* on the tree.



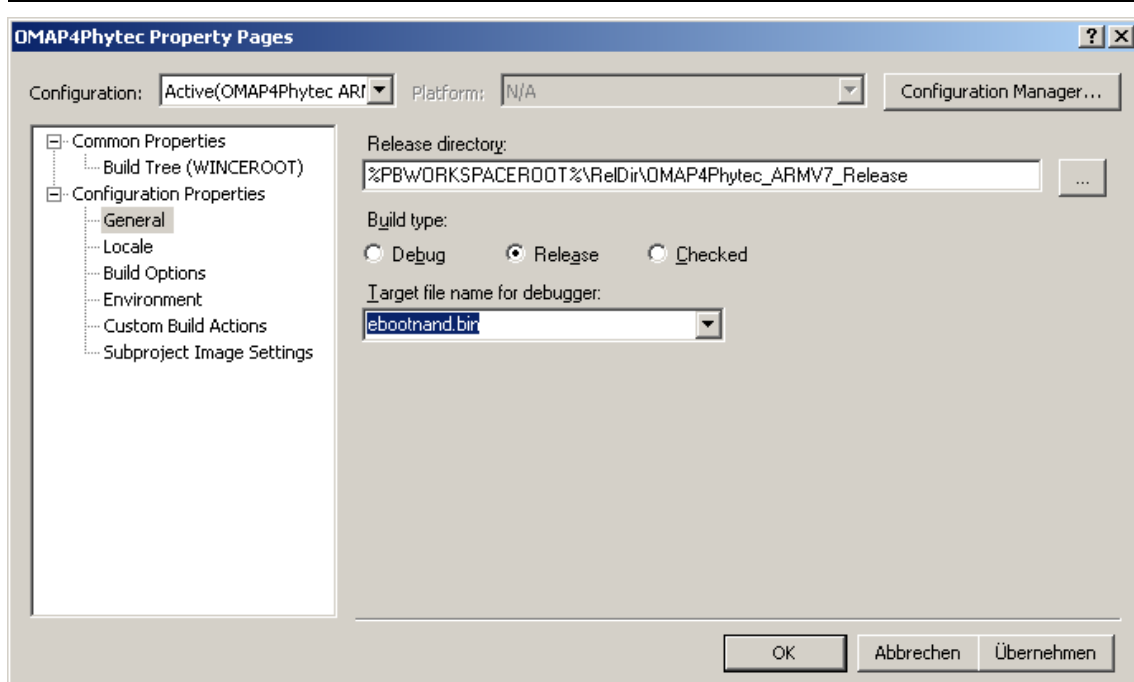
- Select the first bootloader *xldrnanad.bin* in the drop down box *Target file name for debugger:* and press OK.
- Select *Target / Connectivity Options...* from the Visual Studio 2008 menu bar.
- Select *OMAP4 Device* in the *Target Device* drop down box.
- Select *Ethernet* in the *Kernel Download* and *Kernel Transport* settings.



- Click *Settings* beside the *Kernel Download* Drop down box to open the *Ethernet Download Settings* window.
- Change to the HyperTerminal window and press '0' ("Exit and Continue") 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 by pressing *Apply* in the first window and *Apply* and *Close* in the second one.



- When the download is finished, the image has been downloaded in flash and the message *INFO: XLDR/EBOOT/IPL downloaded, spin forever* should appear on the HyperTerminal.
- Please power down the board.
- On the Visual Studio menu select *Target -> Detach Device*.
- Select *Project-> OMAP4Phytec Properties* in the Visual Studio menu.
- The window *OMAP4Phytec Property Pages* appear. Expand *Configuration Properties* and select *General* on the tree.



- Select the second bootloader *ebootnand.bin* in the drop down box *Target file name for debugger:* and press OK.
- Power up the board and the bootloader will automatically download the second bootloader to your device.
- When the download is finished, the image has been downloaded in flash and the message *INFO: XLDR/EBOOT/IPL downloaded, spin forever* should appear on the HyperTerminal.

**Document: WinCE-Kit with phyCORE®-OMAP44xx QuickStart
Instructions**

Document number: L-763e_0 January 2012

How would you improve this manual?

Did you find any mistakes in this manual?

page

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