PHYTEC

Linux-Kit

phyFLEX-AM335x

Quickstart Instructions

Using Eclipse and the GNU Cross Development Toolchain

Note: The PHYTEC Linux-phyFLEX-AM335x-Disc includes the electronic version of the English phyFLEX-AM335x Hardware Manual

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1 Introduction

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In this QuickStart Instructions Manual you will find general information about the PHYTEC phyFLEX-AM335x-Kit and instructions how to start-up with the phyFLEX-AM335x. You will learn how to...

- *... connect to the target in different ways.*
- *... handle with PTXdist and the phyFLEX-AM335x-PD14.1.0 to build your own images.*
- *... working with Eclipse and running example programs on the target with the GNU GCC C/C++ Cross-Development Toolchain.*
- *... and much more good to know things.*

This first Chapter gives a short introduction about the PHYTEC phyFLEX-AM335x-Kit and it's Quickstart. Also you will find general requirements and information to successfully pass the Quickstart.

Please refer to the phyFLEX-AM335x Hardware Manual® for specific information on such board-level features as jumper configuration, memory mapping and pin layout.

1.1 Rapid Development Kit Documentation

This "Rapid Development Kit" (RDK) includes the following electronic documentation on the enclosed Linux-phyFLEX-AM335x-Disc "SO-532" under *PHYTEC/Documentations* or if you are in the Live Environment under */opt/PHYTEC_Tools/Documentation*.

- The PHYTEC phyFLEX-AM335x Hardware Manual
- These Quickstart Instructions
- The BSP Quickstart

1.2 Professional Support Packages Available

If you 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 for you.

For more information please refer to the following sources:

http://www.phytec.de

http://www.phytec.eu

support@phytec.de

Also more contact information can be found on *page 2*.

1.3 Overview of these QuickStart Instructions

This QuickStart gives you an overview of the phyFLEX-AM335x. It's content ranges from the first startup, to building your own kernel and file system, to the point of building your own program with Eclipse. This Quickstart is structured as follows:

1. The *"Getting Started"* section describes the basics such as configure your host platform and starting the phyFLEX-AM335x platform.
2. The *"Getting More Involved"* section provides step-by-step instructions on how to configure, build and install a new kernel and file system.
3. The *"Programming with Eclipse"* section explains how to modify an example application, create and build a new project, and copy programs to the phyFLEX-AM335x using Eclipse with the C/C++ and the Qt plug in .
4. The *"Debugging"* section provides information on how to debug an application with the Eclipse debugging interface.
5. In the Appendix you will find an overview about how to install Linux on the target, how to install the Live DVD on your system and how to setup your own Linux-Host-PC if you don't want to use our Live DVD.

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 icon 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 about the time required to read the following chapter.
	You have successfully completed an important part of this QuickStart.
	You can find information to solve problems.

1.5 System Requirements

The following items will be needed to complete this Quickstart successfully:

- The PHYTEC phyFLEX-AM335x (AM335x)
- The PHYTEC Development Board with the included DB-9 serial cable, Ethernet cross-over cable and AC adapter supplying 12 VDC (min. 2 A)
- PHYTEC Linux-phyFLEX-AM335x-Kit-DVD SO-532
- An IBM-compatible host-PC (586 or higher) with 512 MB RAM (or more)
- DVD-drive with dual/double layer support
- Recommended free disk space: 25 GB if you want to install Ubuntu with our customization

1.6 Contents of the Linux-phyFLEX-AM335x-Kit-DVD

There is a bootable modified *Ubuntu* distribution on the Linux-phyFLEX-AM335x-Kit-DVD. You can run *Ubuntu* directly from your DVD without affecting your current system. Therefore you have the possibility to work with this Quickstart without installing the operating system. To allow a fast and smooth procedure some modifications are applied to the original Ubuntu. A short overview about these modifications:

- Design customization
- Installation of required software to work with this Quickstart
- Preparation of the Toolchain for cross-compilation
- Integration of the PHYTEC Board Support Package

You can find a detailed list in the appendix *"Setup your own Linux-Host-PC"*.

1.7 About the Ubuntu distribution

Ubuntu - which you can find on the Linux-phyFLEX-AM335x-Kit-DVD - is a free and open source operating system based on *Debian Linux*. Basically it is designed for desktop use. Web statistics suggest that *Ubuntu* is one of the most popular operating systems in the Linux desktop environment.

The *Ubuntu* release which we deliver is *12.04.5* and was released on 8. August 2014. *Ubuntu* 12.04 code name "*Precise Pangolin*" is designated as a **Long Term Support (LTS)** release and the first stable release was on 26 April 2012. LTS means that it will be supported and updated for five years.

Our *Ubuntu* version comes with *Unity* as desktop environment, *dpkg* as package management system, the update method is based on *APT (Advanced Packaging Tool)* and the user space uses *GNU*.

2 Getting started

35 min

In this chapter we establish a basis to go through the steps in this Quickstart. First you will learn more about the Ubuntu Live DVD and its handling. Then you will be starting the phyFLEX-AM335x platform for the first time.

2.1 Some notes before starting

As mentioned in the beginning of this Quickstart the Linux-phyFLEX-AM335x-Kit-DVD is an Ubuntu Live DVD with some modifications. This means that you have the freedom to choose if you want to first test the platform under the live-environment or if you will directly install Ubuntu on your hard drive. In the following you can find a list of advantages and disadvantages from the perpective of the live-environment to simplify your decision:

Live-environment vs. Installation	
Pro	**Contra**
• starting directly without preparation • if anything goes wrong, your system is clean after a reset • testing without affecting your current system • all Quickstart steps can be done	• slower performance • after a restart all changes are lost • depending on the size of your RAM you can only do a limited number of changes • not intended for productive use

Of course more involved users can use their own - perhaps existing - distribution. In the appendix *"Setup your own Linux-Host-PC"* you will find a list of modifications which have been made to *Ubuntu*. These modifications can be done specifically to your system but we don't ensure support if you have any system specific problems.
Also you can find the essential programs on our DVD under the directory */PHYTEC*

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2.2 First impressions of the Live DVD

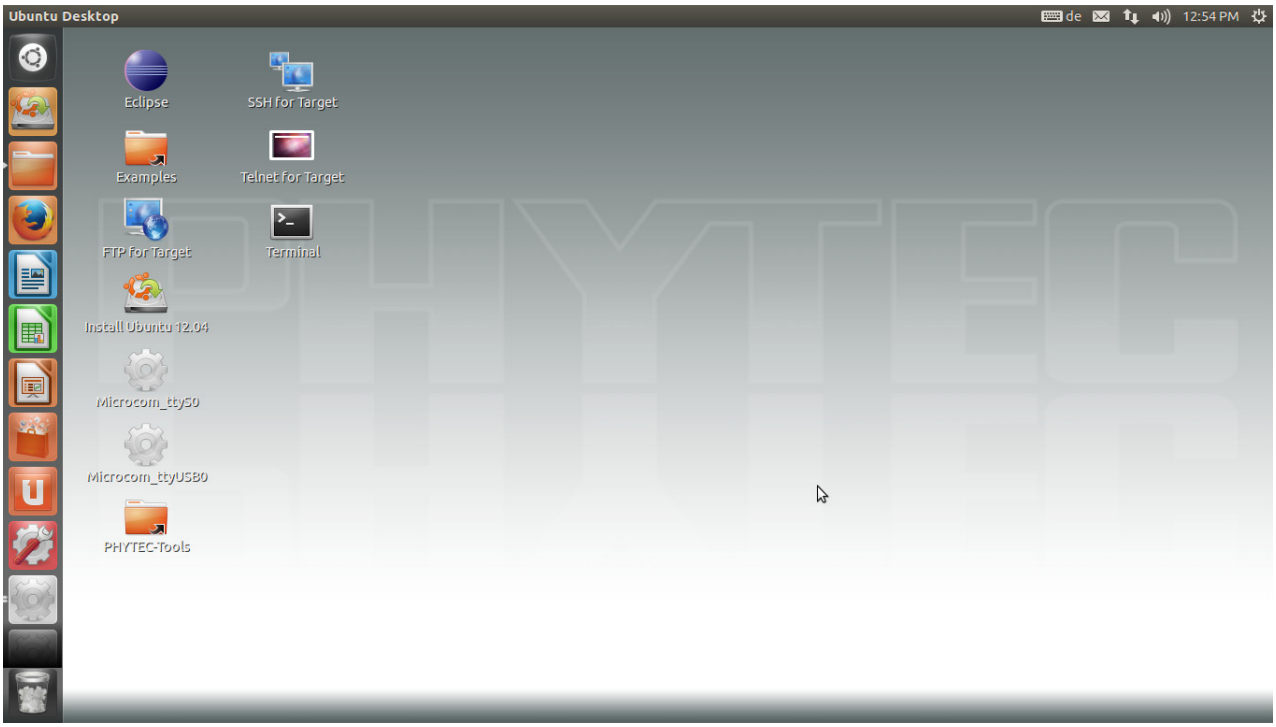
After reading the general notes it's now time for you to start activity. Regardless of which choice you made it is necessary to change the boot priority in the *BIOS*. Your system should first access to the DVD-drive and check if there is a bootable device. We are starting the Live DVD by inserting the Linux-phyFLEX-AM335x-Kit-DVD and boot from the DVD-drive.

When the system has completely booted the following screen appears:

In this window you can choose your desired language and you can also choose between installing the operating system or only testing the system. In the following we assume that you are working with the live-environment.

If you want to install our Live DVD now you will find the relevant instructions in the appendix "*Install the Live DVD on your host*". After having completed this you can go back to this position and continue your work.

After clicking on "Try Ubuntu" the live-environment is loaded and the system welcomes you with the following desktop view.



The operating system is booted and in the next chapter we will focus on your first contact with the target.

2.3 Starting the Hardware

In this section you will learn how to connect your host PC to the target. The connection will be done using a cross-over Ethernet cable and a serial one-to-one cable. You will start Linux from the flash memory on the target and you will be able to log in with the serial communication program *Microcom* as well as via a *telnet* session using a peer-to-peer network connection.

By default every input and output is transmitted over the serial connection you built up earlier.

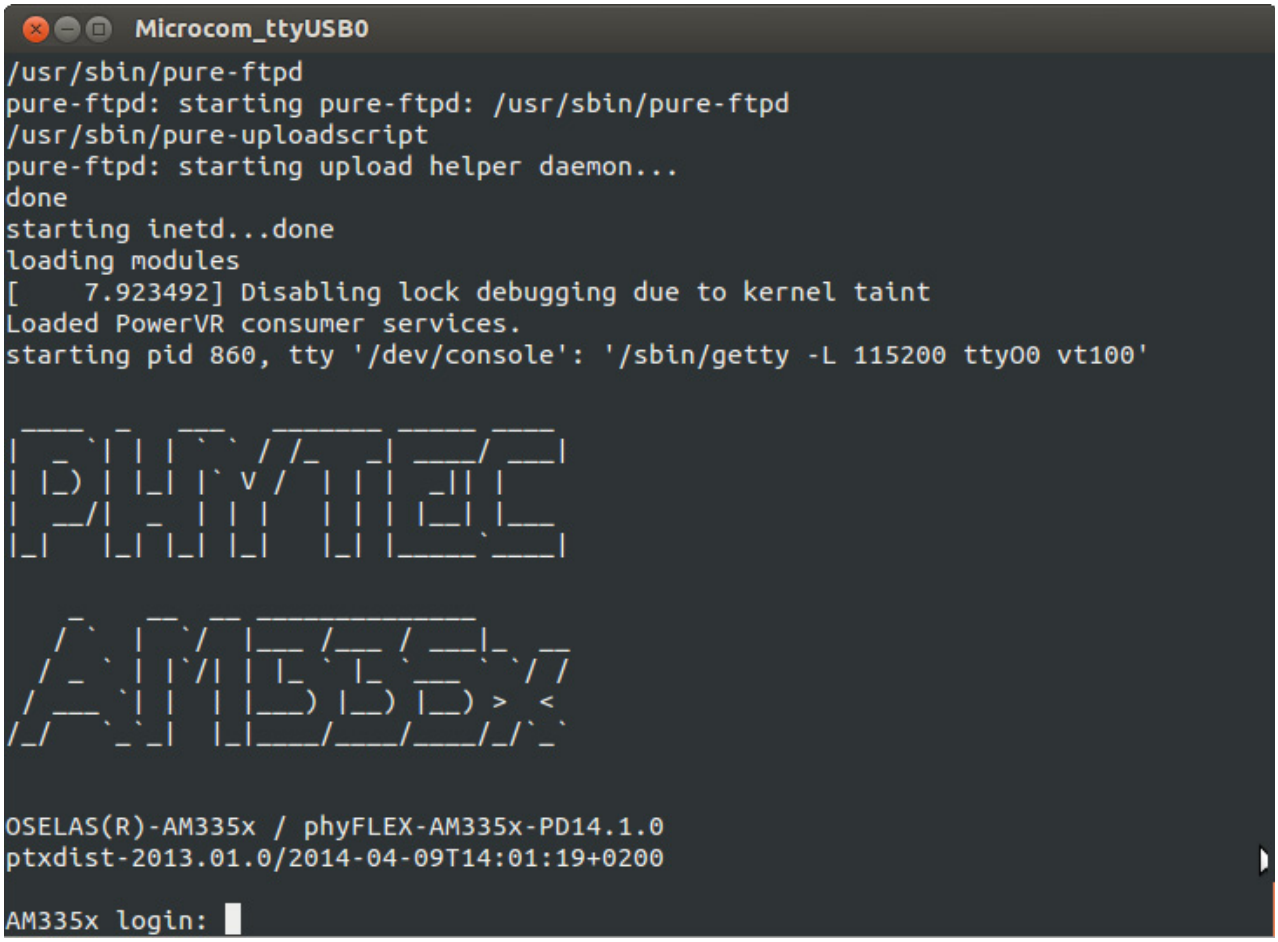
- Connect the serial cable to the UART0 RS232 port on the target and the first serial interface on your host.

Be sure to use the one-to-one serial cable included in this Rapid Development Kit.

- Connect the cross-over Ethernet cable to the Ethernet connector on the target and to the appropriate network card of your host.

- Click the *Microcom_ttyS0* icon on your desktop, if you have connected the target to your serial interface on your host. If you have connected the serial cable with an USB dongle to your PC click the *Microcom_ttyUSB0* icon on your deskop.
- Connect the AC adapter to the power supply connector PWR (12V) on your board.

After connecting the board to the power supply, the target starts booting. When the target has finished loading the system, you should see a screen similiar to the following:



- Type **root** to log in.
- After you have successfully logged in, you can close *Microcom*.

If you don't see the Bootloader and Linux starting and don't get a login prompt, you probably have a kit with Windows CE pre-installed. Please refer to the chapter "Installing Linux on the phyFLEX-AM335x" for instructions on how to install Linux in such a case.

When the target is connected to the power supply, the boot loader *Barebox* is first loaded from the flash memory. Then the boot loader is uncompressing and booting the Linux kernel from the flash. Then the kernel will install the root file system, which is also located in the target's flash.

If you don’t see any output in the *Microcom* window, check the serial connection between the target and your host.
If you have more than one serial port try the others. By default *Microcom* uses */dev/ttyS0*. If you want to use another port you can click on the *Microcom* Icon at your desktop with your right mouse button and select *Properties*. A window opens in which you can change the Properties of the*Microcom* Icon. Click in the *Command* field and search for *"-p /dev/ttyS0"*. Change it for example to */dev/ttyS1* and so on if you have more than one serial port. If you are connecting the board via RS232 to USB change it to */dev/ttyUSB0*.
The *-p* Parameter defines the port which *Microcom* will use.
If the *Microcom* window does not open, one reason could be a *lock*-file which was created when Microcom was not correctly terminated. Delete this file by opening a terminal and type:
sudo rm /var/lock/LCK..*

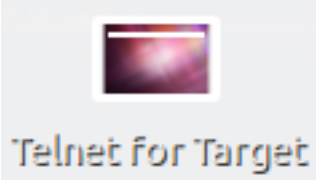
After starting the target and see the serial outputs in *Microcom* we want to connect to the target via Ethernet.

Before we can start connecting to the target we must configure the IP address of our host.

We recommend that the host PC is not connected to any other network. The target and host will be connected with a cross-over cable via a peer-to-peer connection. If your host is part of a company's network, we recommend disconnecting your host from such a network.

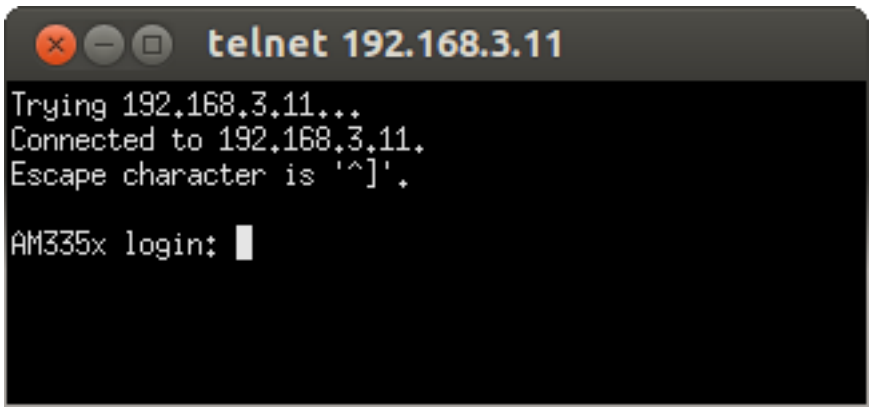
- In the Unity-Panel at the left of the desktop click on *Dash Home* write *System Settings* in the input field and press *Enter*.
- After the *System Settings* dialog appears click on *Network* icon.
- Choose the right wired network if more than one is present and click on *Options*....
- Select the *IPv4 Settings* register and select *Manual* in the *Method* drop-down box.
- Click on *Add* and enter as IP address **192.168.3.10** and subnet mask **255.255.255.0**
- At last click on *Apply* to save this connection and close the windows.

Now we are ready to test the network connection.



- Click the *Telnet for Target* icon on your desktop.

A new window with a connection to the target opens.



If you can see the user login in the opened window, the network was configured correctly.

- Close the window.

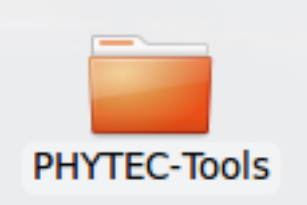
Troubleshooting:
If you don’t see the user login, check the Ethernet connection between the target and the host. If you have installed more than one network card on your host, be sure to connect the cable to the network card which you have configured with the IP address **192.168.3.10**.
If you do not see the login, you may not have set up the right IP address for your host. You can check the settings of your network card by clicking on *System Preferences Network Connections*.
Another common reason is that the MAC address of the target isn't set correctly. You can check this by opening *Microcom* if it is not already started and reset the target. Press any key to stop autoboot and type: **edit /env/config**
Search for a line beginning with "*eth0.ethaddr*=". After finding this entry compare it to the MAC address which you find on the target. If you don't find this line, insert it manually, followed by the MAC address which you find on the target. For example **eth0.ethaddr=00:50:C1:D1:F1:E1**. After you have made the change quit the program by pressing **CTRL+D** , type **save** and reset the target.

You have successfully set up all configurations to access your phyFLEX-AM335x from your host.

2.4 Copying an Example to the Target

In this section you will learn how to copy an example program to the target using the FTP protocol with the *Nautilus* file browser. After that you will execute an example on the target. At the end of this passage you can find some information on how to copy and execute a file on the target using the command line.

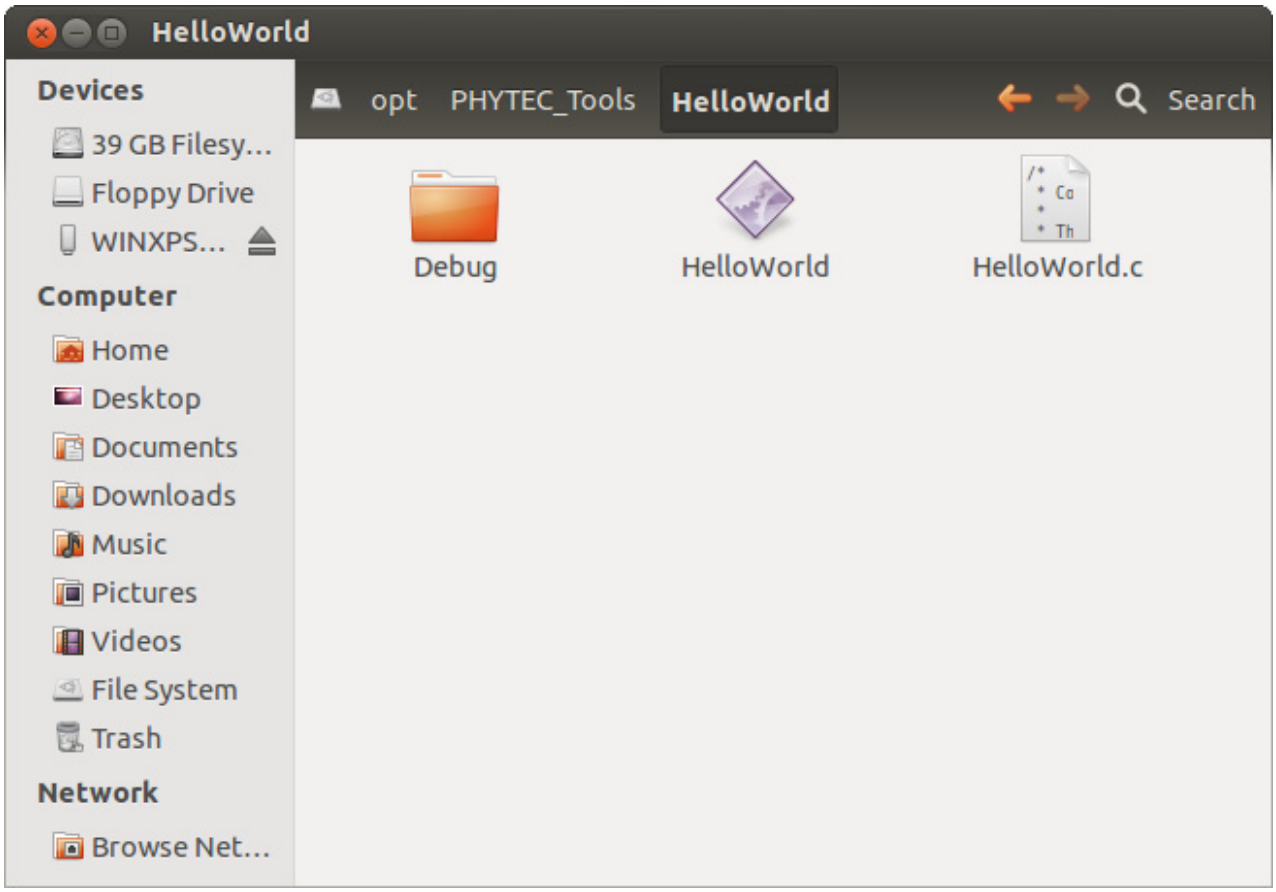
2.4.1 Copying a Program to the Target



- First click the *PHYTEC-Tools* icon on your *Unity* desktop.

A new window with the contents from the PHYTEC_Tools directory opens.

- Enter the *HelloWorld* folder.



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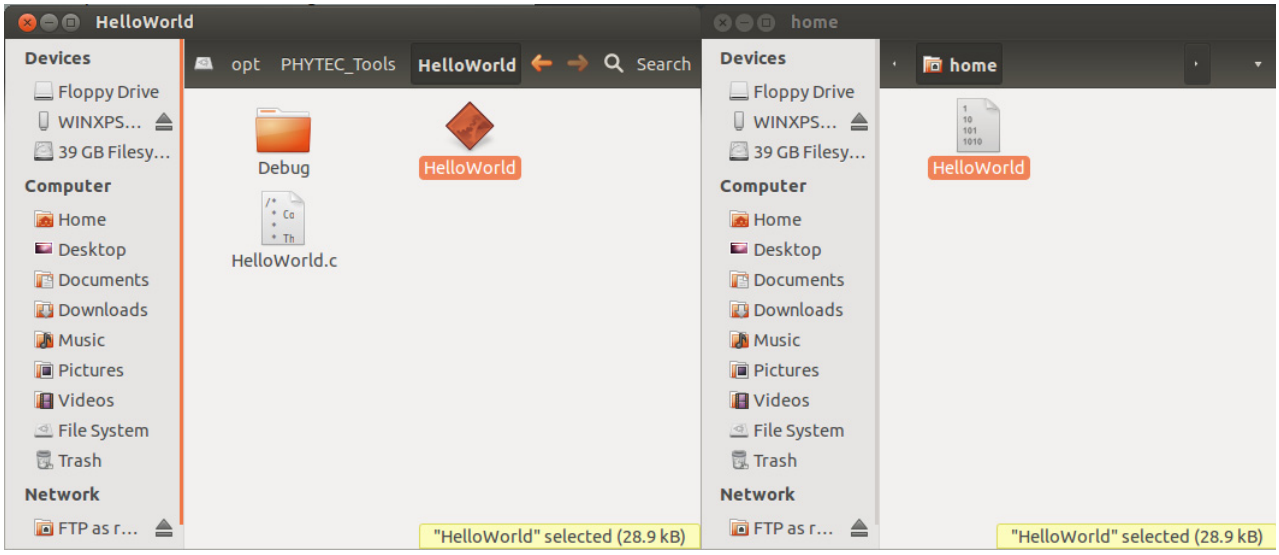
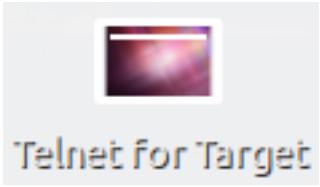
- Click the *FTP for Target* icon on your desktop.

A window with an FTP session with the target opens. User is *root* and password is empty. Now you have two windows opened, one for the target and one for the host. You can use these two windows to copy files per “drag and drop” from the host to the target (and vice versa).

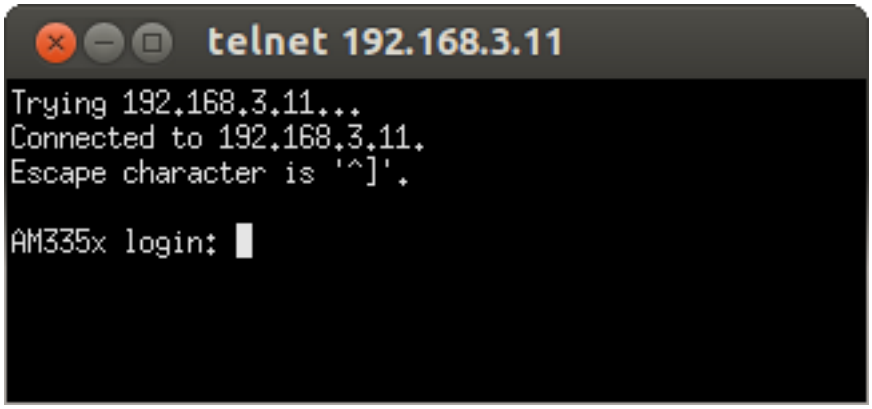


- Select the window that lists the *HelloWorld* program on your hard disk.
- Click the *HelloWorld* program with the left mouse button and drag and drop it to the second window.
- Close the two windows.

2.4.2 Using Telnet to execute a Program on the Target



- Click the *Telnet for Target* icon on your *Unity* desktop.



- Enter **root** as login and press **Enter**.
- Enter **./HelloWorld** and press **Enter**.

The program starts and you should see the following output:

Welcome to the World of PHYTEC!

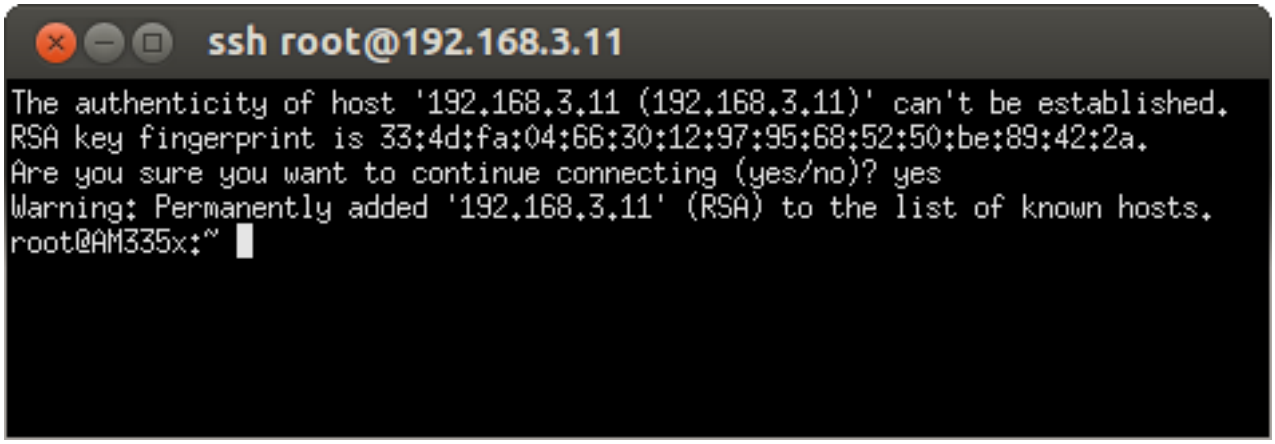
2.4.3 Using SSH to execute a Program on the Target

SSH can be used if you want to execute a program directly from the host on the target. Later, this will be used to execute programs out of Eclipse on the target. Before you can start programs out of Eclipse, you have to log in to the target via SSH from the command line for the first time. This is necessary to add the RSA public key of the target to the list of known hosts.

When the host connects to the target, the file*~/.ssh/known_hosts* (on the host) is consulted when using RSA host authentication to check the public key of the target. The key must be listed in this file to be accepted. When the host connects to the target for the first time, you will be asked to store the target's RSA public key to your *~/.ssh/known_hosts*. If you agree to do this, then the host will be able to connect to the target without entering a password.

- Click the *SSH for Target* icon on the desktop.

A new window opens.



In this window you can see that the authenticity of the phyFLEX-AM335x can't be established. This is normal if you want to create an SSH connection for the first time.

- Enter **yes** and press **Enter** to continue. The RSA public key of the target will be permanently added to the list of the known hosts.

Troubleshooting:
If an error occurs and you can't see the *root@phyFLEX:~>* prompt, open a terminal window and enter the following command:
rm ~/.ssh/known_hosts

Try to log in again by entering:
ssh root@192.168.3.11
Enter **yes** to add the target to the list of known hosts.

Now you should see the target's prompt.

We expect that you did not change the SSH configuration file on your host. If you have changed this file, the authentication may not work.

Now you are logged in and you can execute programs on the target.

- Type **./HelloWorld** to start the program you had copied to the phyFLEX-AM335x before.

The program starts and you should see the following output:

Welcome to the World of the PHYTEC!

- Close the SSH window.

You have successfully copied and executed an example application on the target.

2.5 Advanced Information

2.5.1 Copying a Program to the Target with the command line

- Open a new terminal window.
- Change to */opt/PHYTEC_Tools/HelloWorld*:
  cd /opt/PHYTEC_Tools/HelloWorld
- Copy the application to the target by typing:
  scp HelloWorld root@192.168.3.11:/home
  Be sure to enter a slash followed by a space after the IP address.

2.5.2 Executing a program on the target

- Open a Telnet session to the target:
  telnet 192.168.3.11
- Type **root** and press **Enter**.
- Type **./HelloWorld** to start the application.
- Type **exit**.

2.5.3 Executing a program directly on the target using SSH

- To start the program, type:
  ssh root@192.168.3.11 ./HelloWorld
  After the program has finished, SSH will log out automatically.

3 Getting more involved

70 min

In this chapter you will go through some continuative topics. First you will configure and compile your own kernel and root file system. With the help of PTXdist you can add additional features, or disable them if they are not needed. After compiling the new images, you will learn how to write the newly created kernel and root file system into target's flash memory and how to start from.

Then you will start working with the Eclipse platform using the C/C++ Development Tools (CDT) in conjunction with the GCC C/C++ tool chain. You will learn how to configure the Eclipse platform and how to open an existing project. After that you will create your first own project and modify the example's source code.

At the end of this chapter you will execute the program as an external application out of Eclipse. Additionally, you will add your application to the startup configuration of the target so it starts automatically when the phyFLEX-AM335x boots.

3.1 Working with the Kernel

In this part you will learn how to configure and build a new Linux kernel and a root file system. Then you will configure the kernel and the root file system with the help of *PTXdist*, a tool to build the Board Support Package and to create your own image. After the configuration you will create your own image.

To configure your images the following files are already pre-installed:

- ptxdist-2013.01.0.tgz (Tool from our partner *Pengutronix*, that configures and compiles BSPs)
- phyFLEX-AM335x-PD14.1.0.tar.gz (BSP for the phyFLEX-AM335x)
- OSELAS-2012.12.1 Toolchain: arm-cortexa8-linux-gnueabihf.tar.bz2

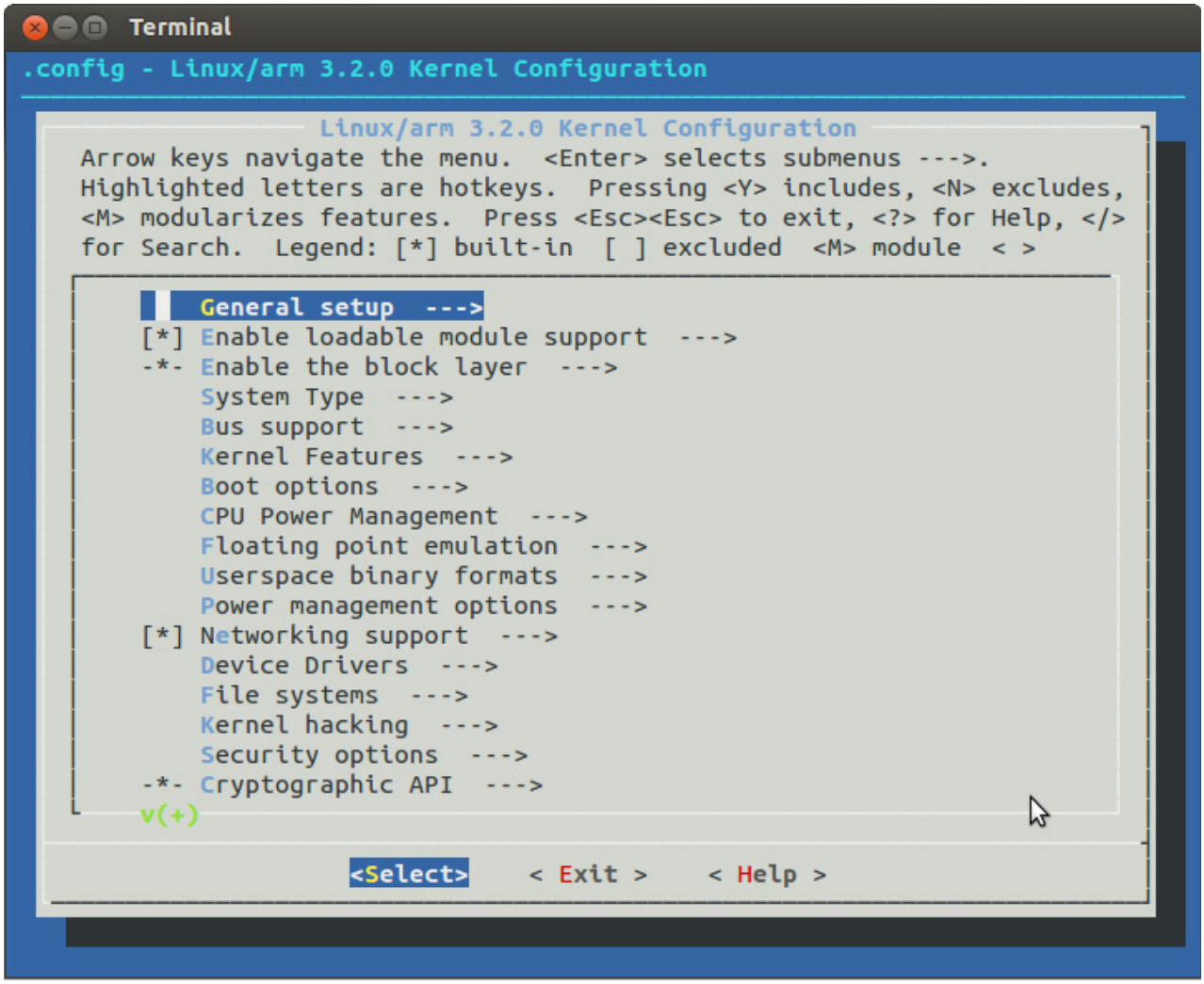
All files are also downloadable from our ftp server or you can find it on our Linux-phyFLEX-AM335x-Kit-DVD under */PHYTEC/BSP/*. If you want other versions check our ftp server too.
ftp://ftp.phytec.de/

3.2 Working with the filesystem

Let's start by opening a new terminal if you haven't already opened it and change into the directory of the pre-installed BSP:

- Click the terminal icon on your desktop.
- Type the following command to change to the BSP-directory:
  cd /opt/PHYTEC_BSPs/phyFLEX-AM335x-PD*
- Type the following to show the deselected/selected kernel features:
  ptxdist kernelconfig

You should see the following output on the terminal:

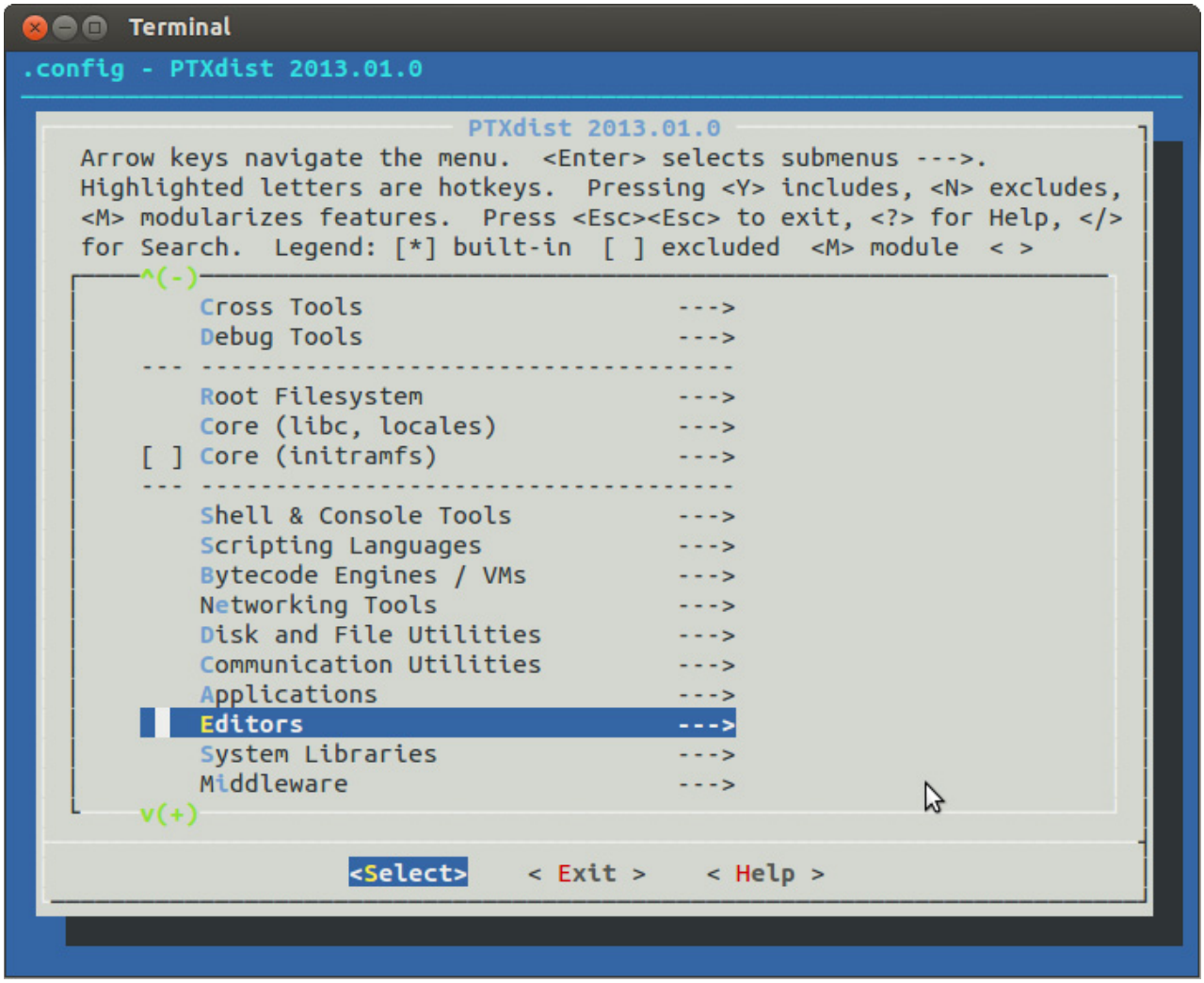


- Leave the menu by selecting < *Exit* > at the bottom with the arrow right key and press **Enter**.

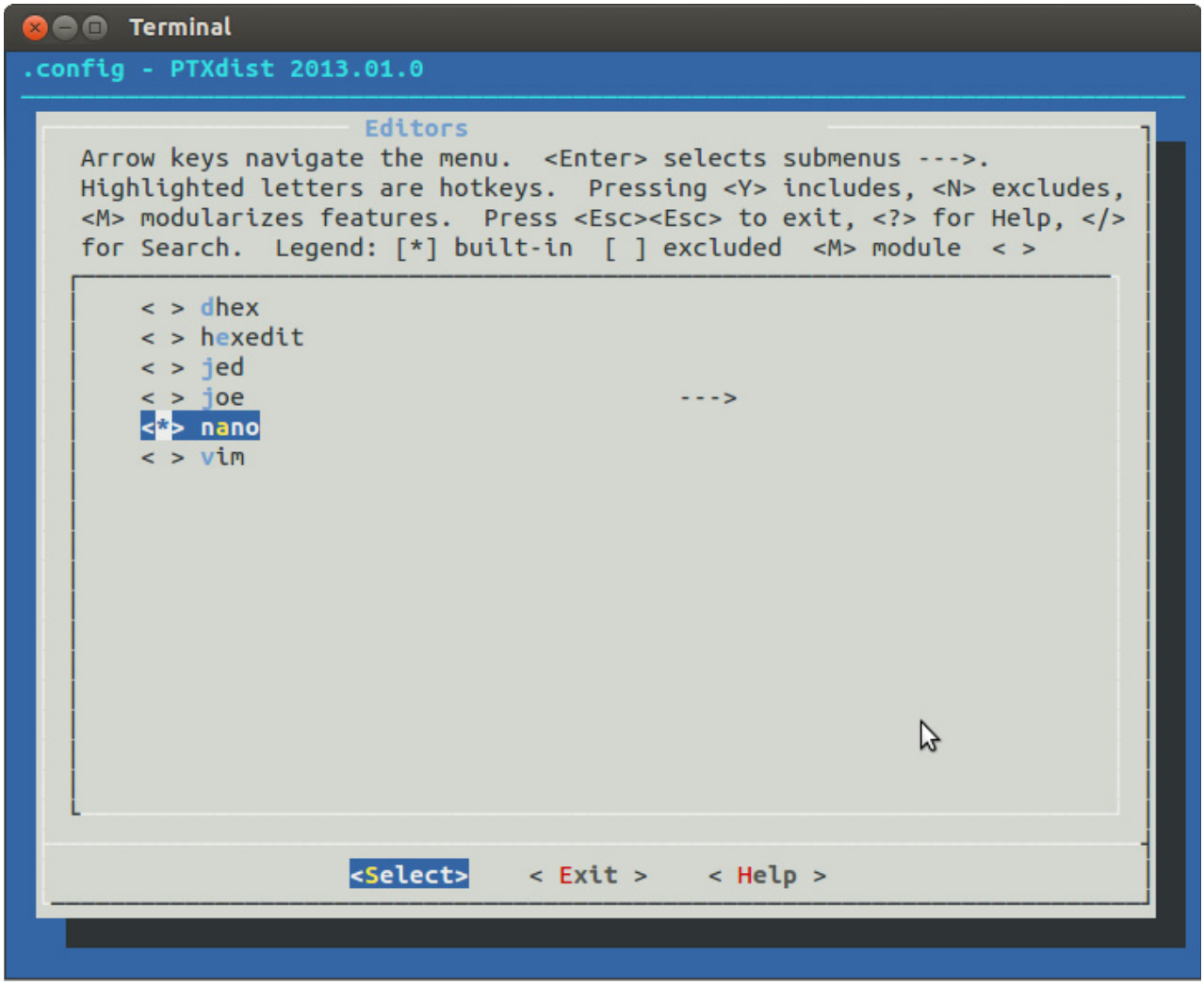
You can find more information about *PTXdist* and the toolchain in our "BSP-Quickstart phyFLEX-AM335x" under */opt/PHYTEC_Tools/Documentation/*.

- Now let's take a look into the user space and add a new program in the root file system. Type the following:
  ptxdist menuconfig

You should see the following output:

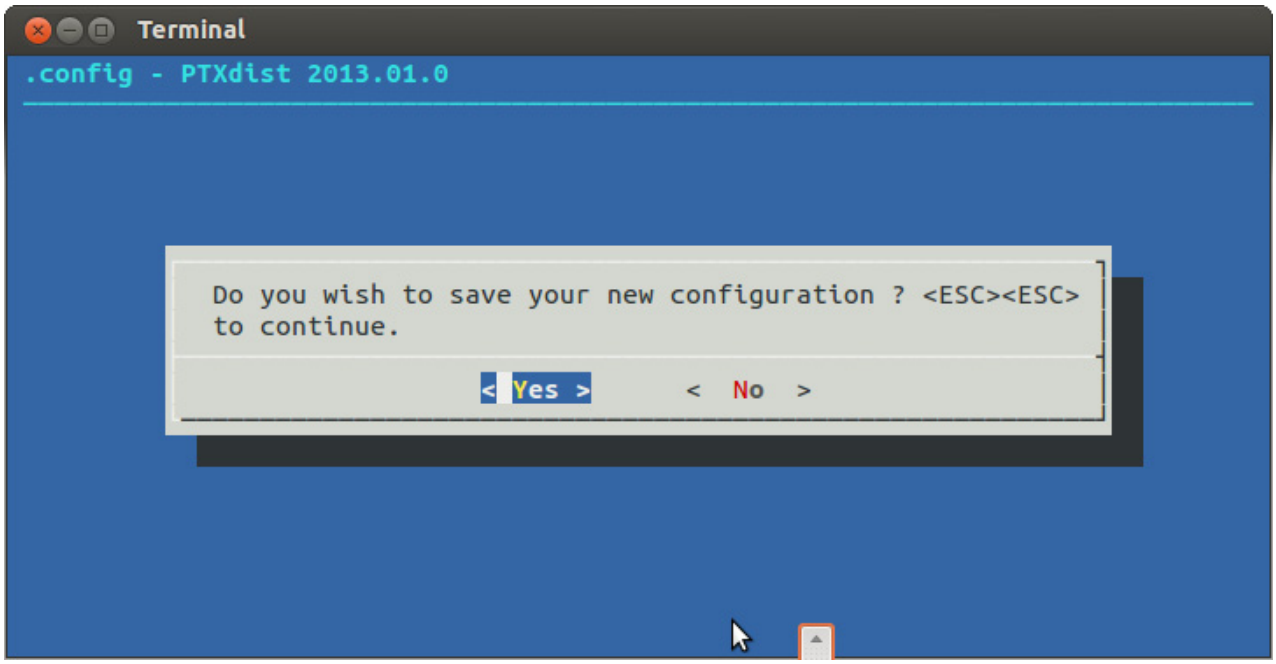


- For example we add *nano* to the user space which is another editor. With the help of the up and down arrow key we select *Editors* and press **Enter**.
- After that, we navigate to *nano* in the list of editors. By pressing **Y** we selected nano as "*built-in*".



- Leave the menu by selecting < *Exit* > at the bottom with the arrow right key and press **Enter**. Repeat this until a question appears to save the new configuration.

- Select < *Yes* > and press **Enter** to save the configuration.



- Now we can start building the configured BSP. In the terminal type:
  ptxdist go
- After it is finished you can finally create the root file system by calling:
  ptxdist images

You will find the kernel named *linuximage* and the root file system named *root.ubi* in the directory *platform-phyFLEX-AM335x/images/*.

In this section you will build your own kernel and root file system and learn how to configure and compile it. Now you can add new features to your kernel or remove features you do not need.

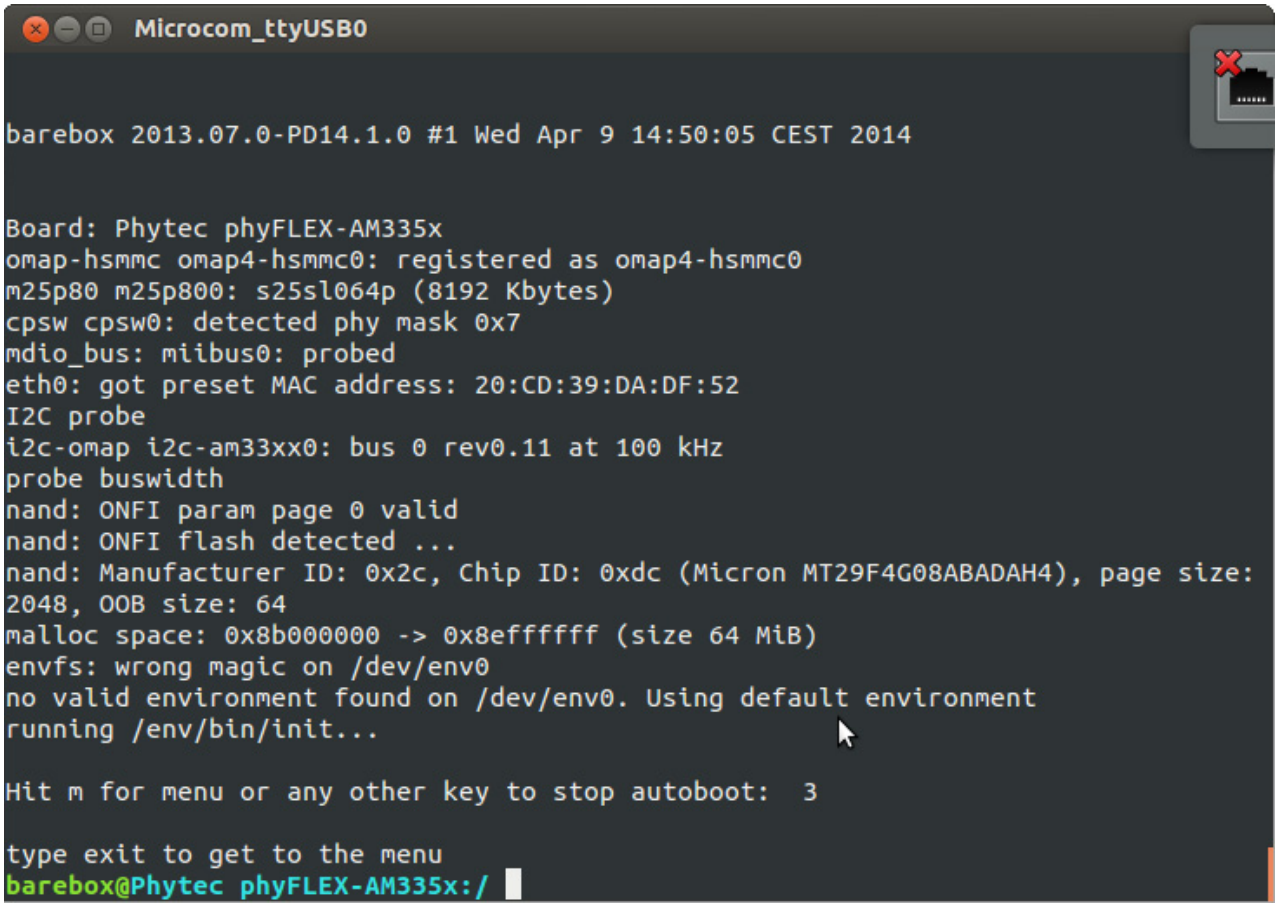
3.3 Writing the Images into the Target´s Flash

In this section you will find a description on how to write the newly created images into the phyFLEX-AM335x's flash memory. Before the images can be written into the flash, the target will have to download them from a TFTP server. This will be done from the command line of the boot loader. The images will be copied into target's RAM. Then you will have to erase the part of the flash to which you want to copy the images. Finally the images are written from the RAM to the flash.

In the default configuration you will find four partitions on the target: The first partition contains the boot loader, the second is used to store the boot loader settings, the third partition stores the Linux kernel, and the fourth contains the root file system.

You should never erase the Barebox partition. If this partition is erased, you won't be able to start your target anymore. In such a case please contact our support department.

- First open a new terminal window if it is not opened yet. Then change to the directory /opt/PHYTEC_BSPs/phyFLEX-AM335x-PD*.
- Copy the new images to the */tftpboot* directory and exit:
  cd platform-phyFLEX-AM335x/images
  cp linuximage /tftpboot
  sudo cp root.ubifs /tftpboot
  exit
- Open Microcom and press the RESET button on the target.
  You will see the output *"Hit any key to stop autoboot"*.
- Press any key to stop autoboot.



- Check the network settings with following command:
  ifup eth0
  devinfo eth0
  The target should present the this lines:
  ipaddr=192.168.3.11
  netmask=255.255.255.0
  gateway=255.255.255.0
  serverip=192.168.3.10
  If you need to change something, type:
  edit /env/network/eth0
  Edit the settings, save them by leaving the editor with Strg-D, then type saveenv and reboot the board.

Now we download the images from the TFTP server to the target's RAM, then we erase the required flash and write the images from the RAM into the flash.

- Type **erase /dev/nand0.kernel.bb** to erase the kernel partition.
- Type **cp /mnt/tftp/linuximage /dev/nand0.kernel.bb** to download the kernel using TFTP and write it into the target's flash. The copy process can take up to several minutes.
- Now we flash the root filesystem type:
  ubiformat /dev/nand0.root
  ubiattach /dev/nand0.root
  ubimkvol /dev/ubi0 root 0
  cp /mnt/tftp/root.ubifs /dev/ubi0.root
- Type **boot** to boot the phyFLEX-AM335x with the new kernel and root file system.
- After the target has successfully finished booting, type **root** to log in.
- Now we can test our new editor *nano* by trying to open a file with it.
  nano /etc/profile.environment
- Close *nano* by pressing **CTRL+X**.
- Close Microcom when nano is closed.

Troubleshooting:
If any problem occurs after writting the kernel or the root file system into the flash memory, you can restore the original kernel (*uImage-pfla03*) and root file system (*root-pfla03.ubifs*) from the */tftpboot* directory.

In this section you learned how to download images from a tftp server into the RAM of the target. The images have been written from RAM to flash and finally the target was started with the new images.

4 Working with Eclipse

35 min

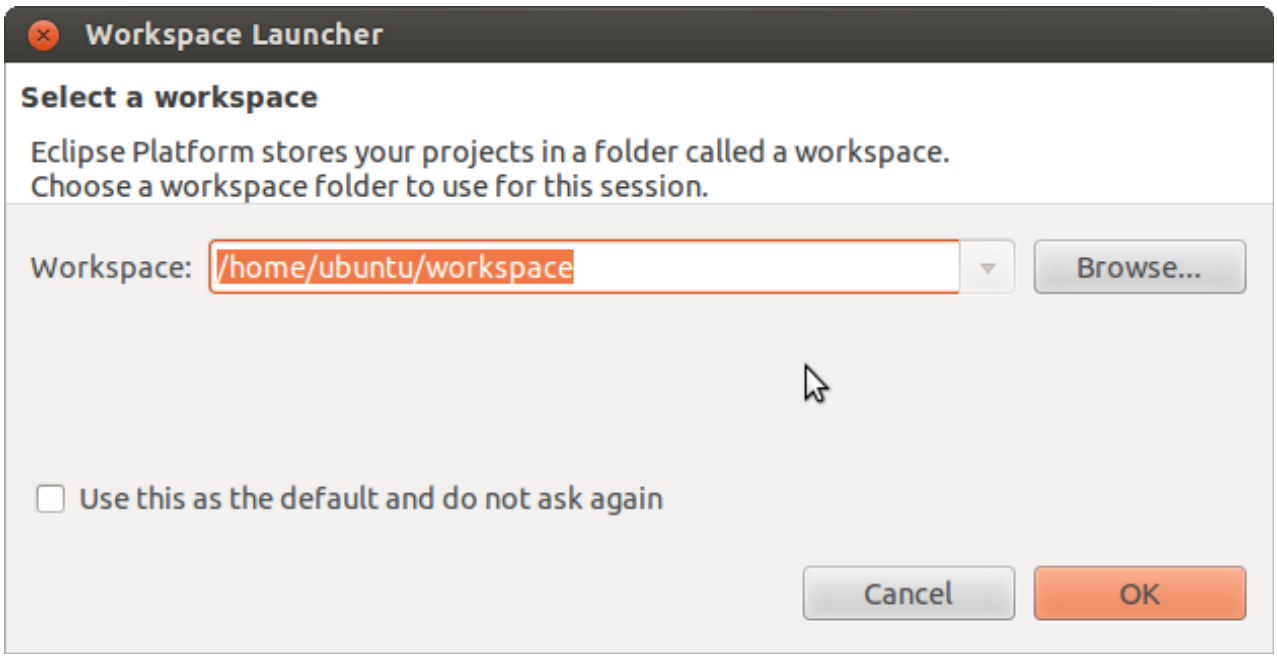
With the help of example projects, we will teach you how to work with eclipse during this chapter. First we take a look on the C programming language. At the end of this chapter we explain how to execute your written programs automatically when booting the target.

4.1 Programming in the C/C++ perspective

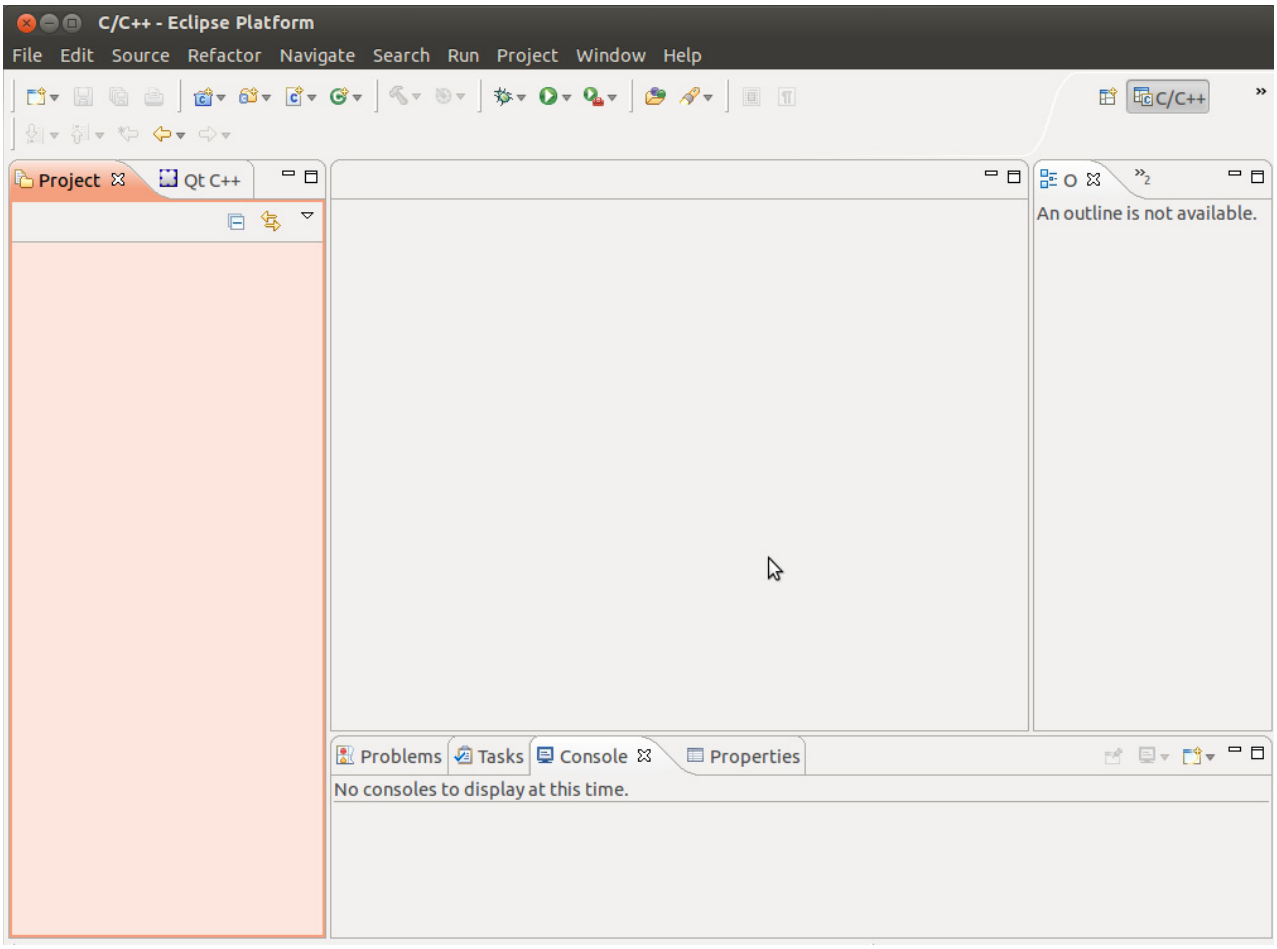
We are starting with the C/C++ workbench. Therefor you will import an existing Eclipse project into your workspace. The imported example project will be compiled with the cross compiler. After compiling the project, you will copy and execute the newly created program on the target.

4.1.1 Handle with the demo project

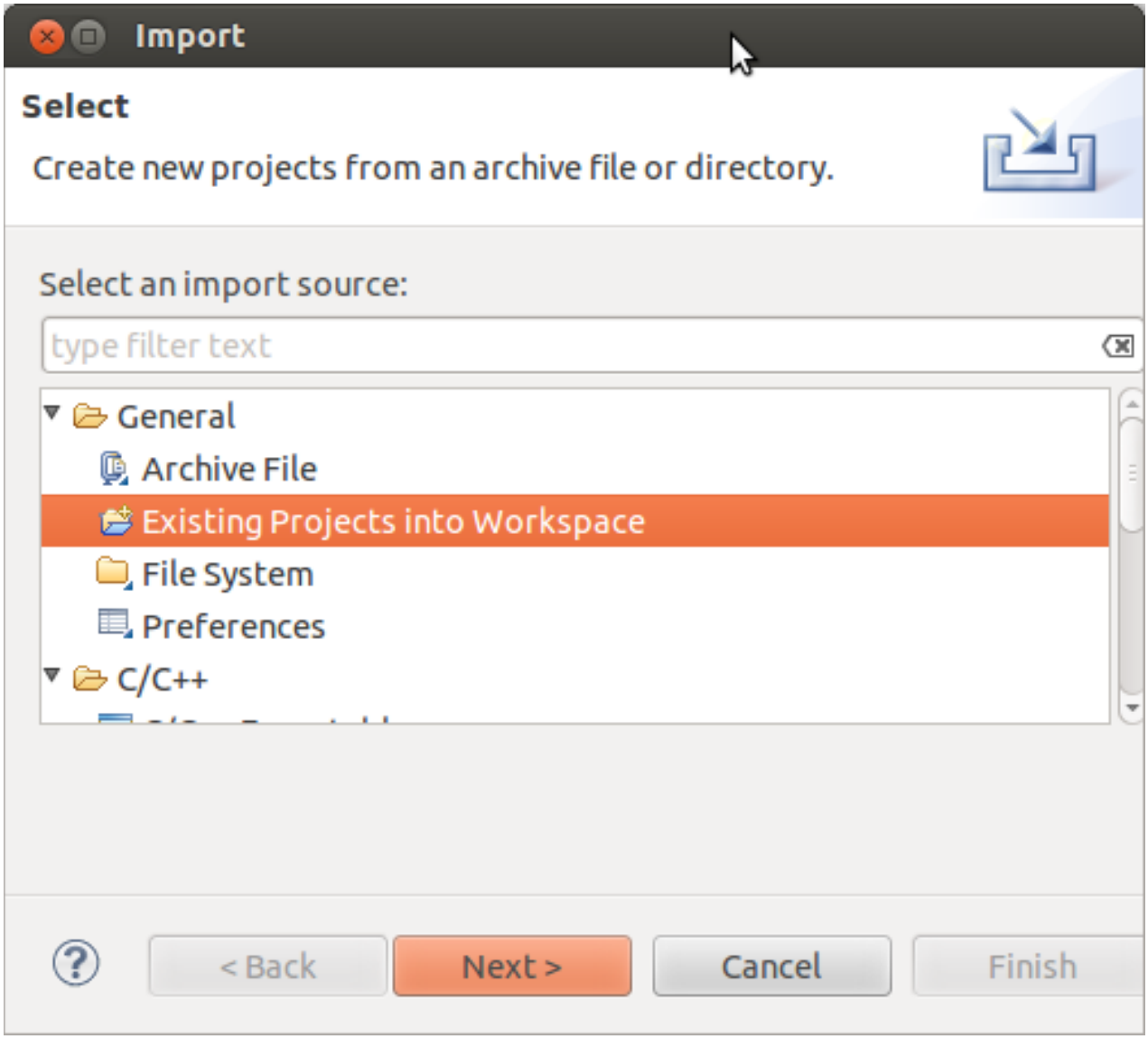
- Click the *Eclipse* icon to start the application. You can find this icon on your desktop.



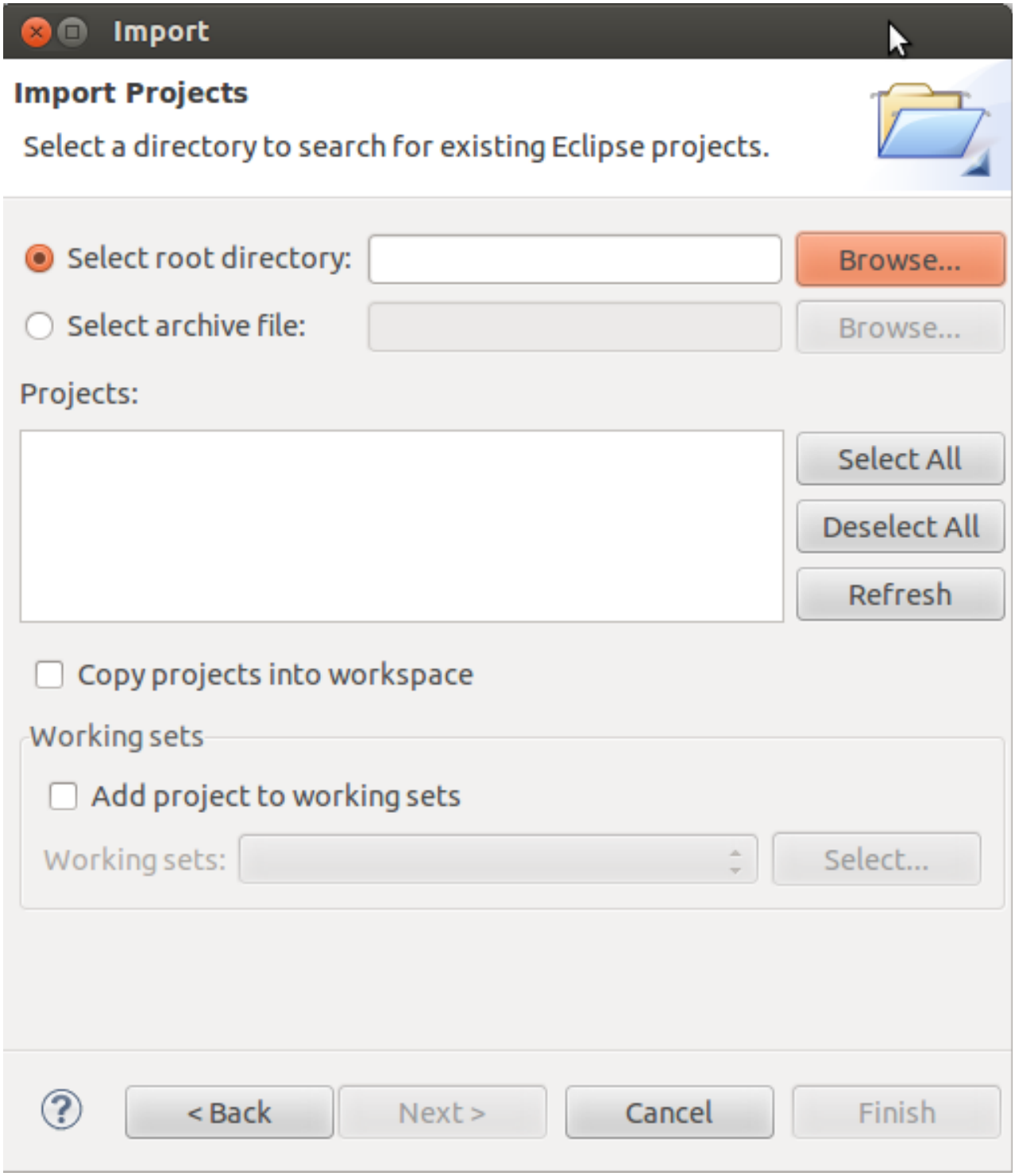
- Confirm the workspace directory with OK.
- You see the Eclipse workbench now. We will first import an existing project now.



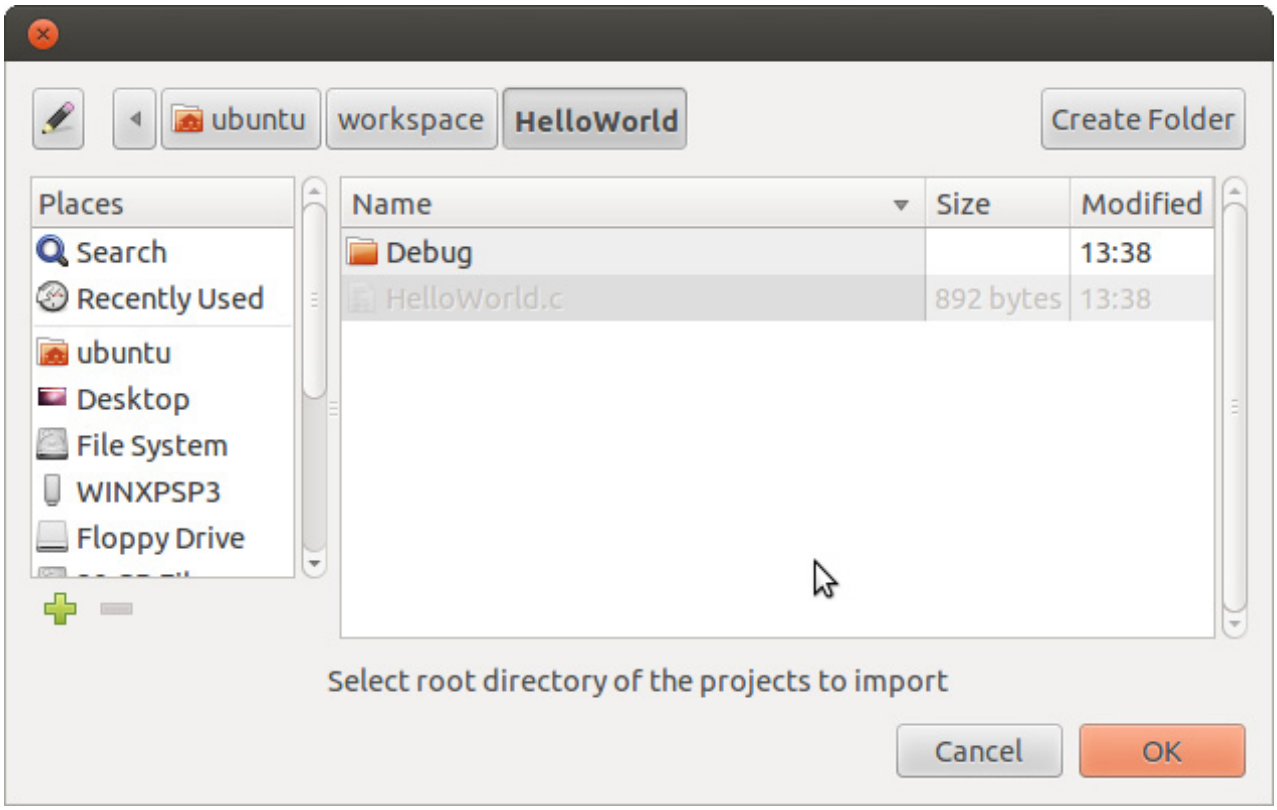
- Select File ▶ Import from the menu bar.



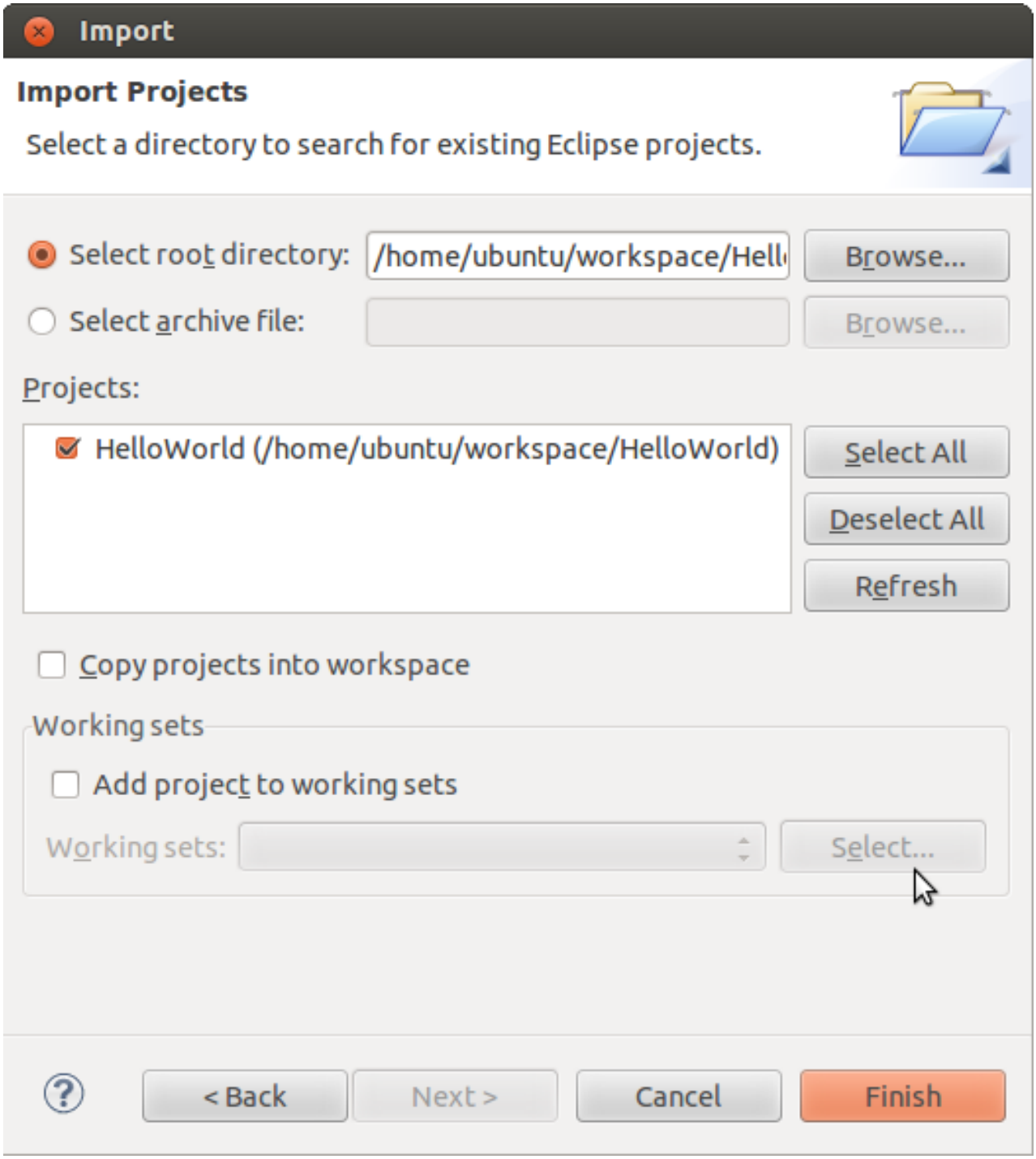
- Select *Existing Projects into Workspace*.
- Click *Next*.



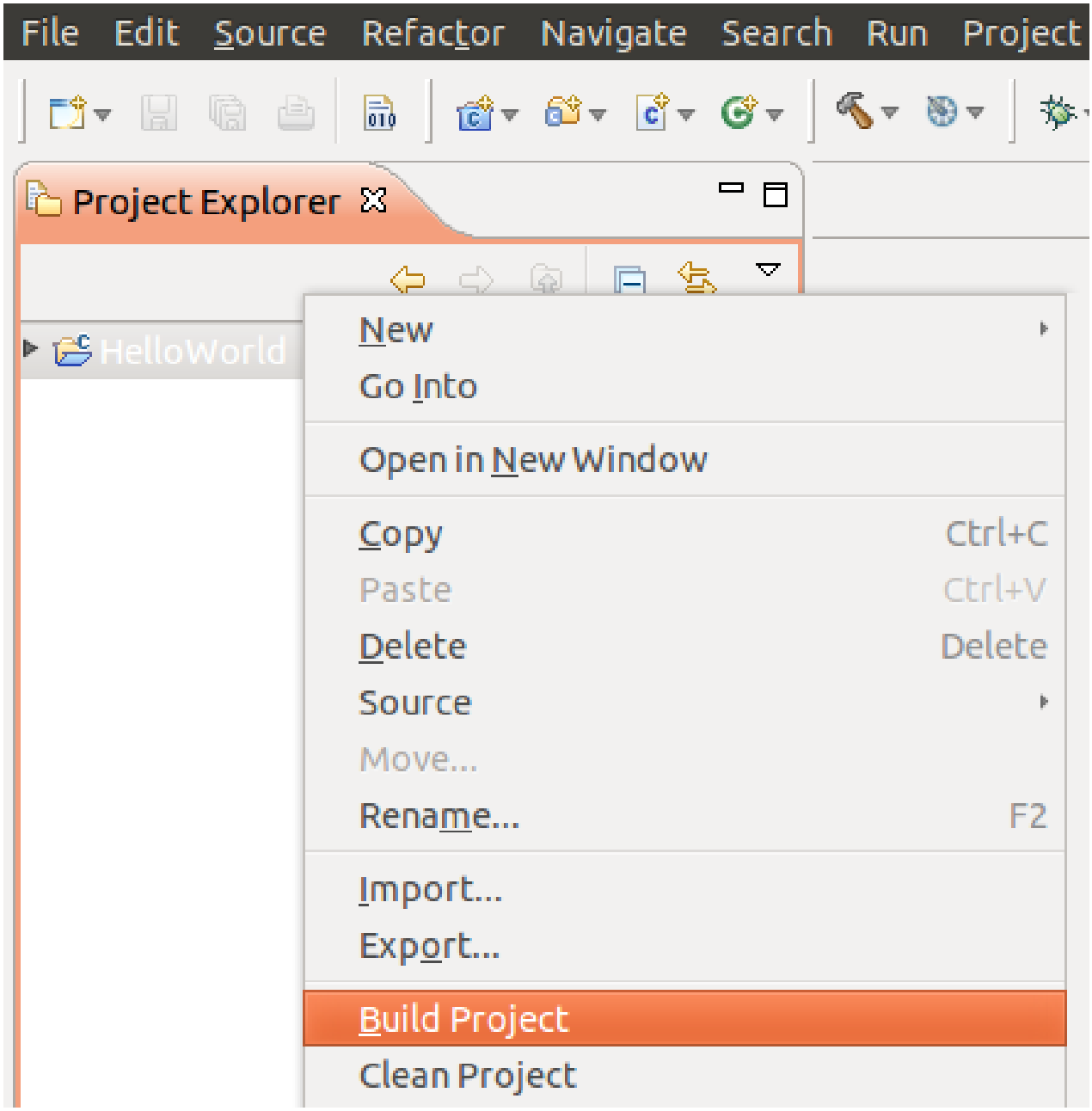
- Select *Browse*.



- Double-click the *HelloWorld* directory under */home/ubuntu/workspace/*.
- Click *OK*.

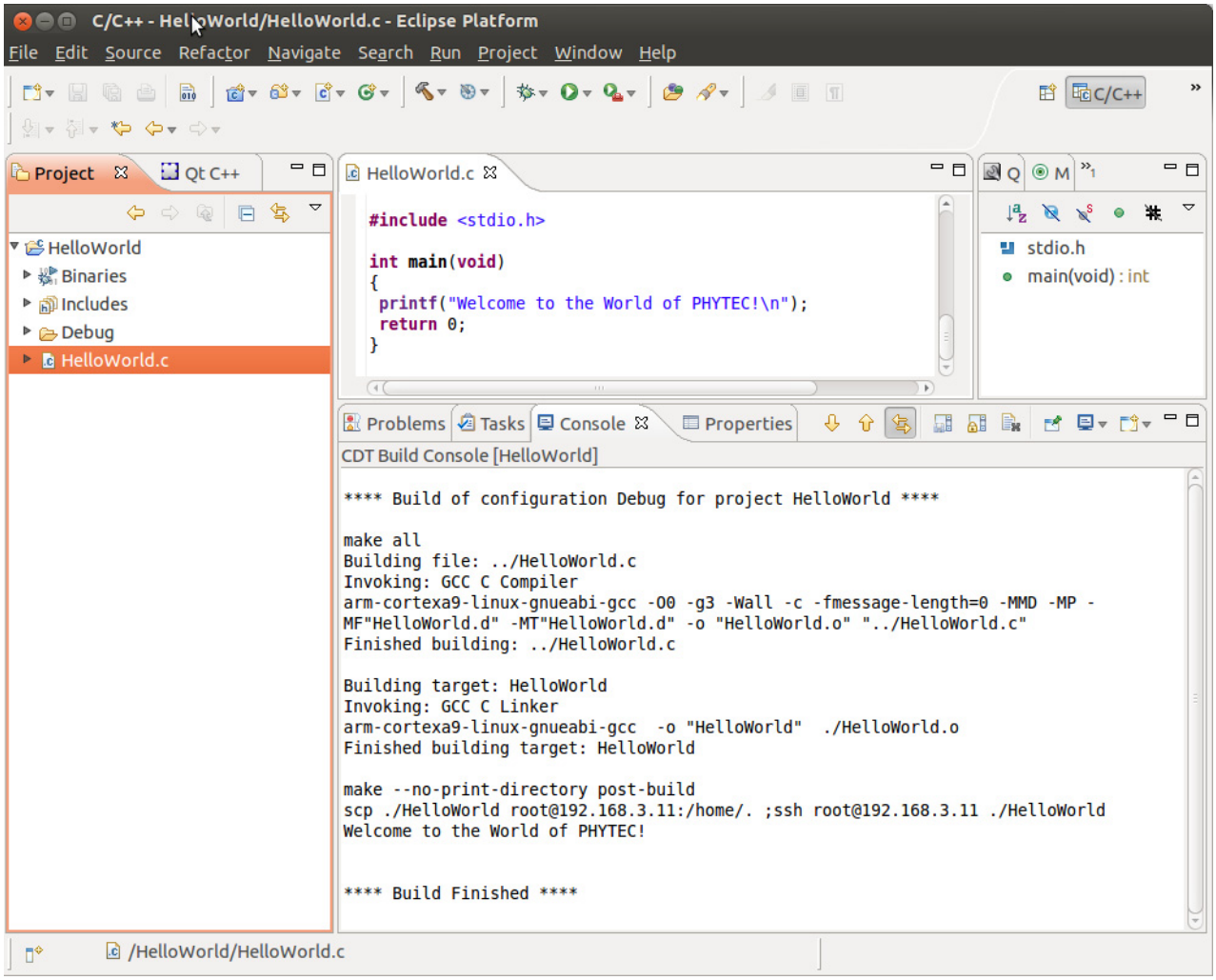


- Select *Finish* to import the project.
- On the left side you see the *Project Explorer* with the imported project. Right click on the *HelloWorld* project and select *Build Project*.



The *HelloWorld* program will be compiled and the *HelloWorld* executable is built for the target. Then the *HelloWorld* file is copied to the target using *secure copy*. After the file has been copied to the target, the program is executed on the target using *SSH*.

You will see the following content in the *Console* window:



To build the project new select *Project* ▶ *Clean...* and *Project* ▶*Build Project*.

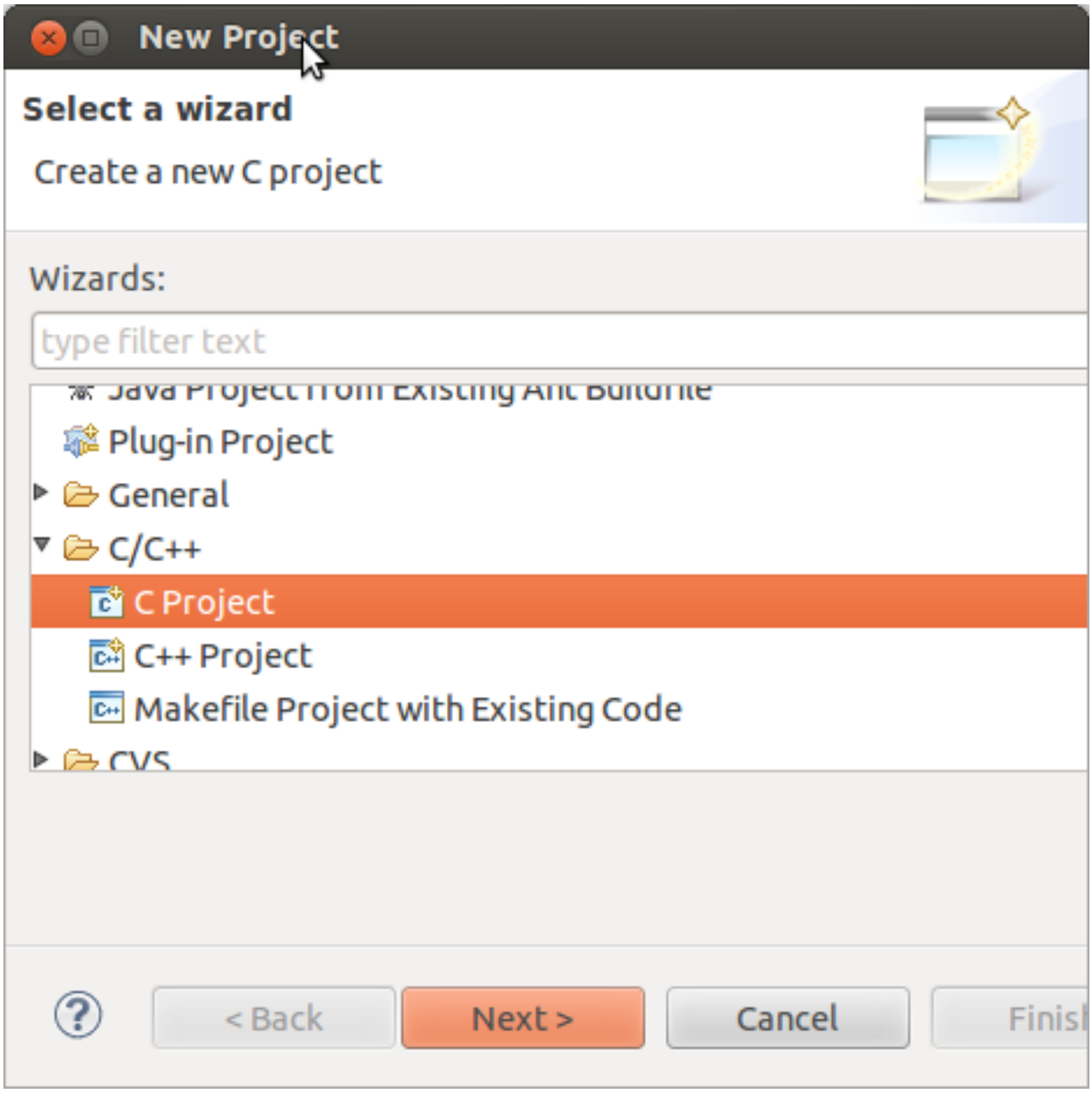
You have successfully passed the first steps with the Eclipse IDE. You are now able to import existing projects into the Eclipse workspace. You can compile an existing project and execute the program on the target.

4.1.2 Creating a New Project

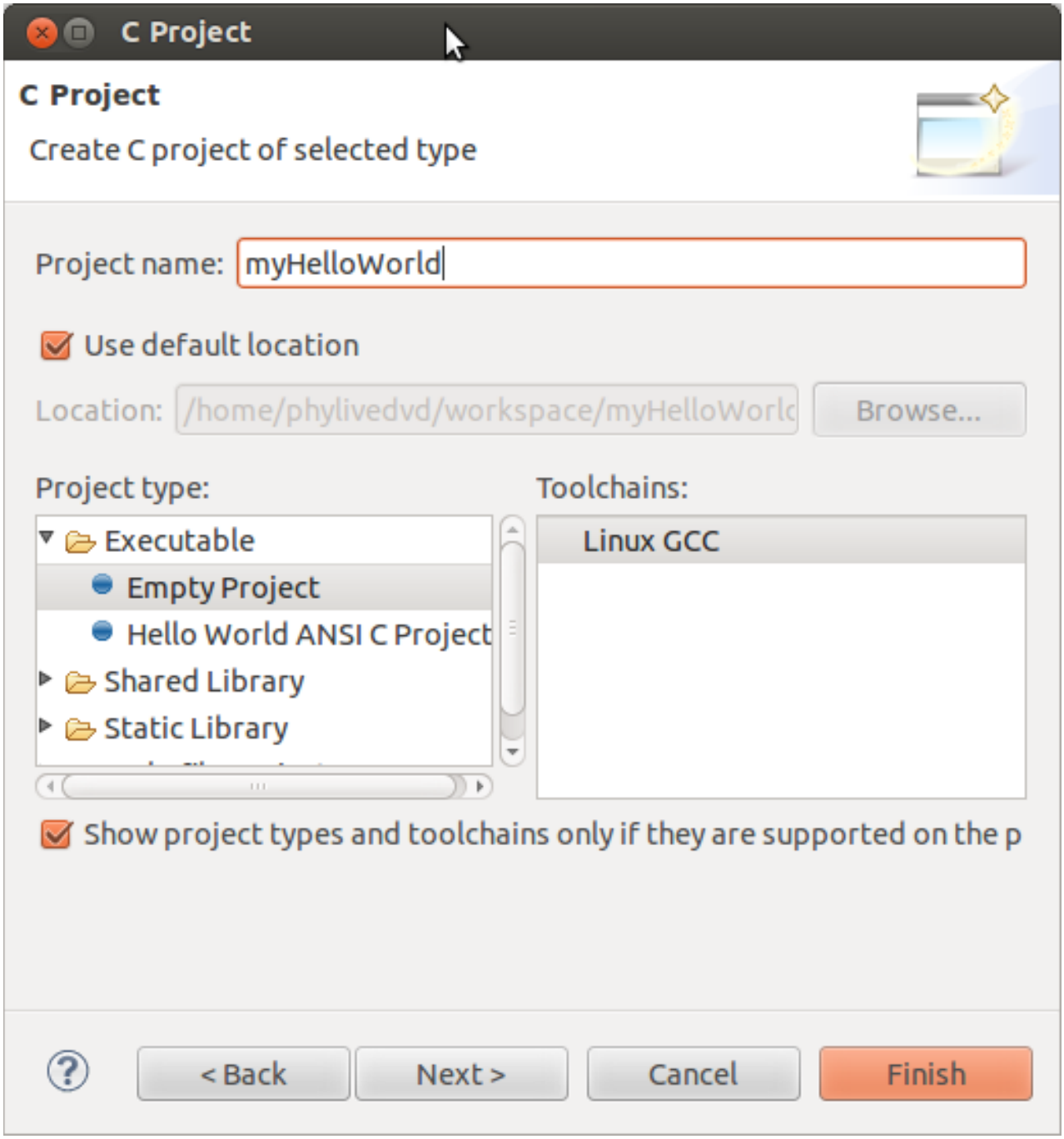
In this section you will learn how to create a new project with Eclipse and how to configure the project for use with the GNU C/C++ cross development toolchain.

- Open Eclipse if it isn't already opened.
- Select *File* ▶ *New* ▶ *Project* from the menu bar.

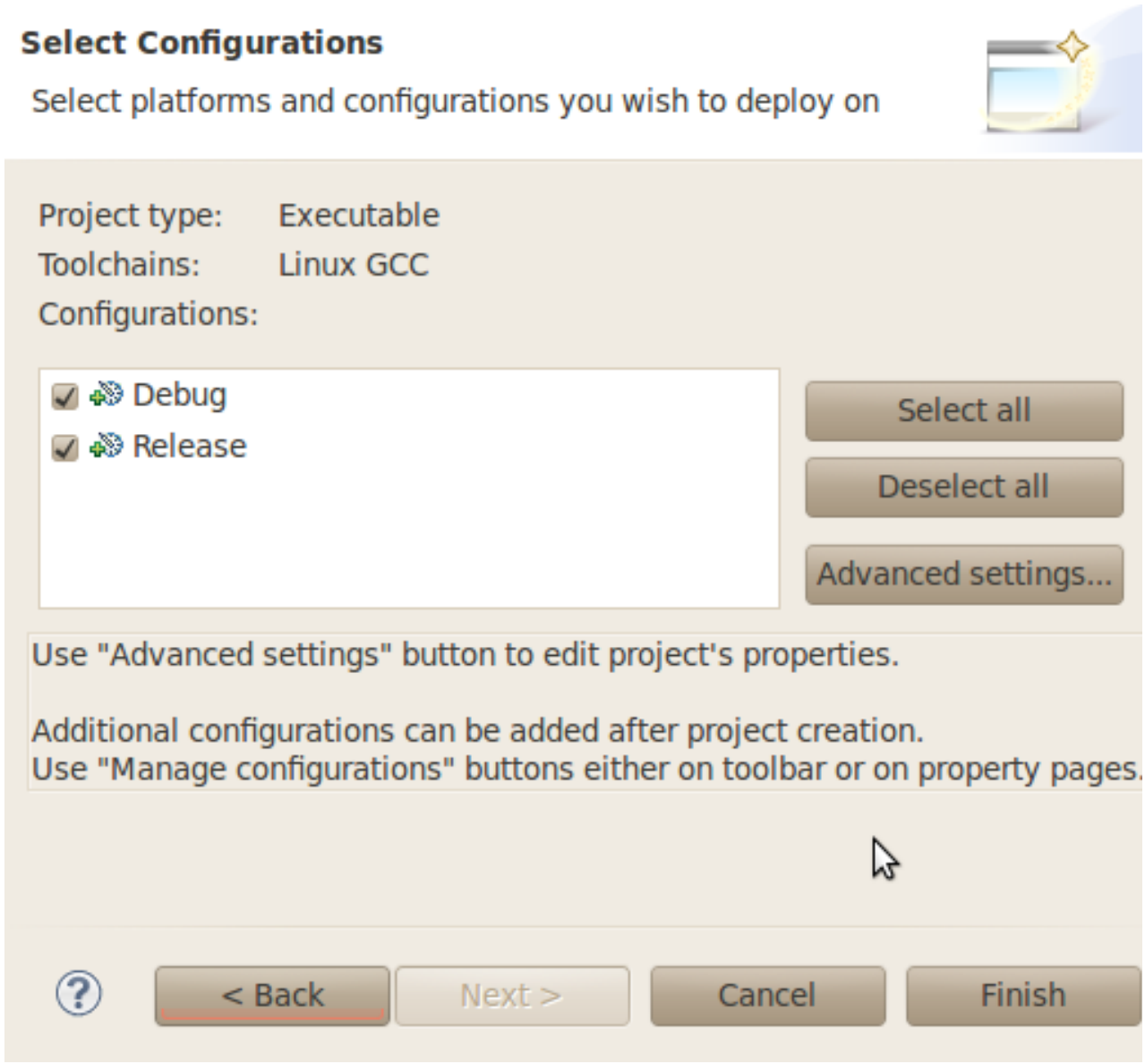
A new dialog opens.



- Select *C Project* and click *Next*.

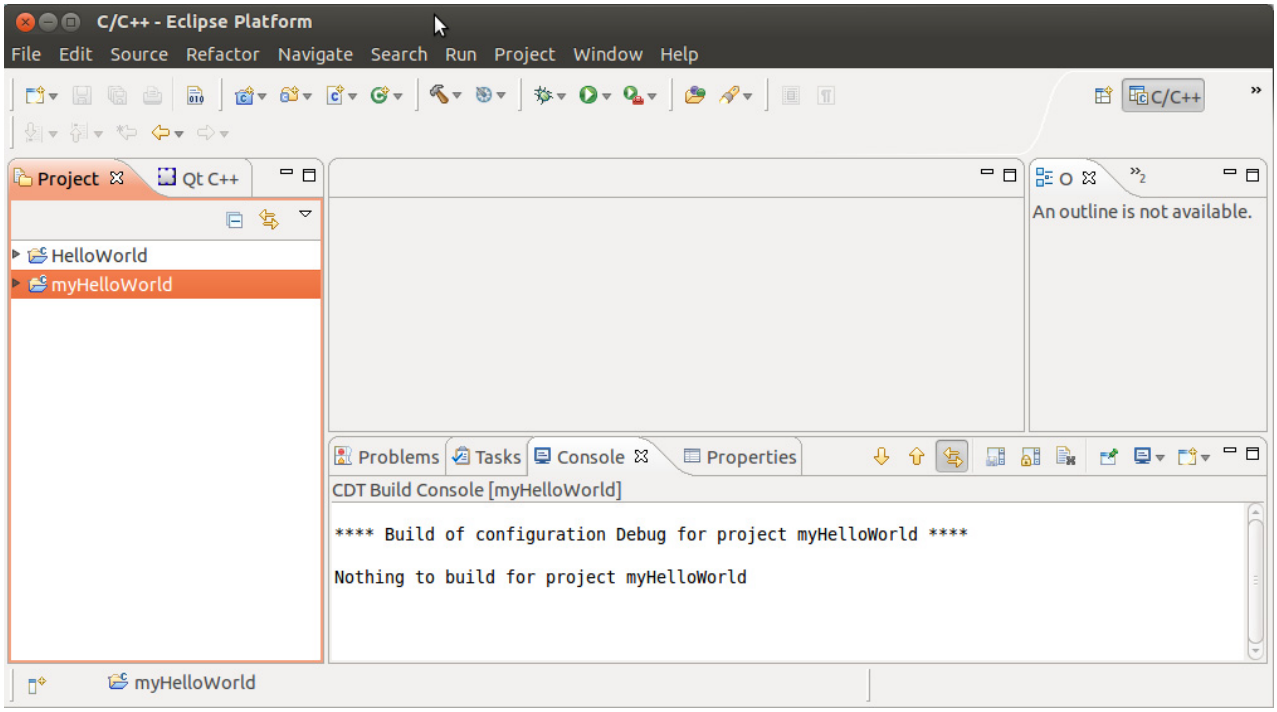


- Enter the project name *myHelloWorld* and click *Next*.

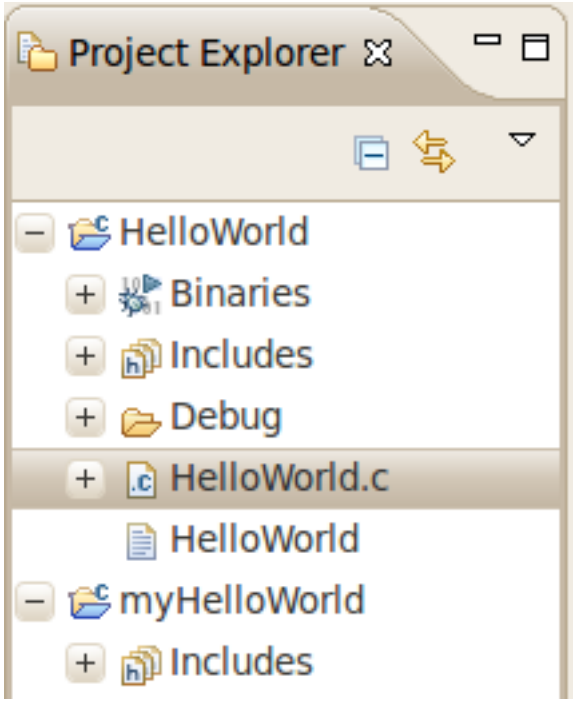


- Click *Finish*.

You will see the C/C++ IDE with the *myHelloWorld* project.



- Double-Click the *HelloWorld* project which we have worked with previously.
- Right-click on *HelloWorld.c* in the *HelloWorld* project.
- Select *Copy*.



- Select the *myHelloWorld* project.
- Right-click the *myHelloWorld* project.
- Select *Paste*.
- Double-click on *HelloWorld.c* in the *myHelloWorld* project.

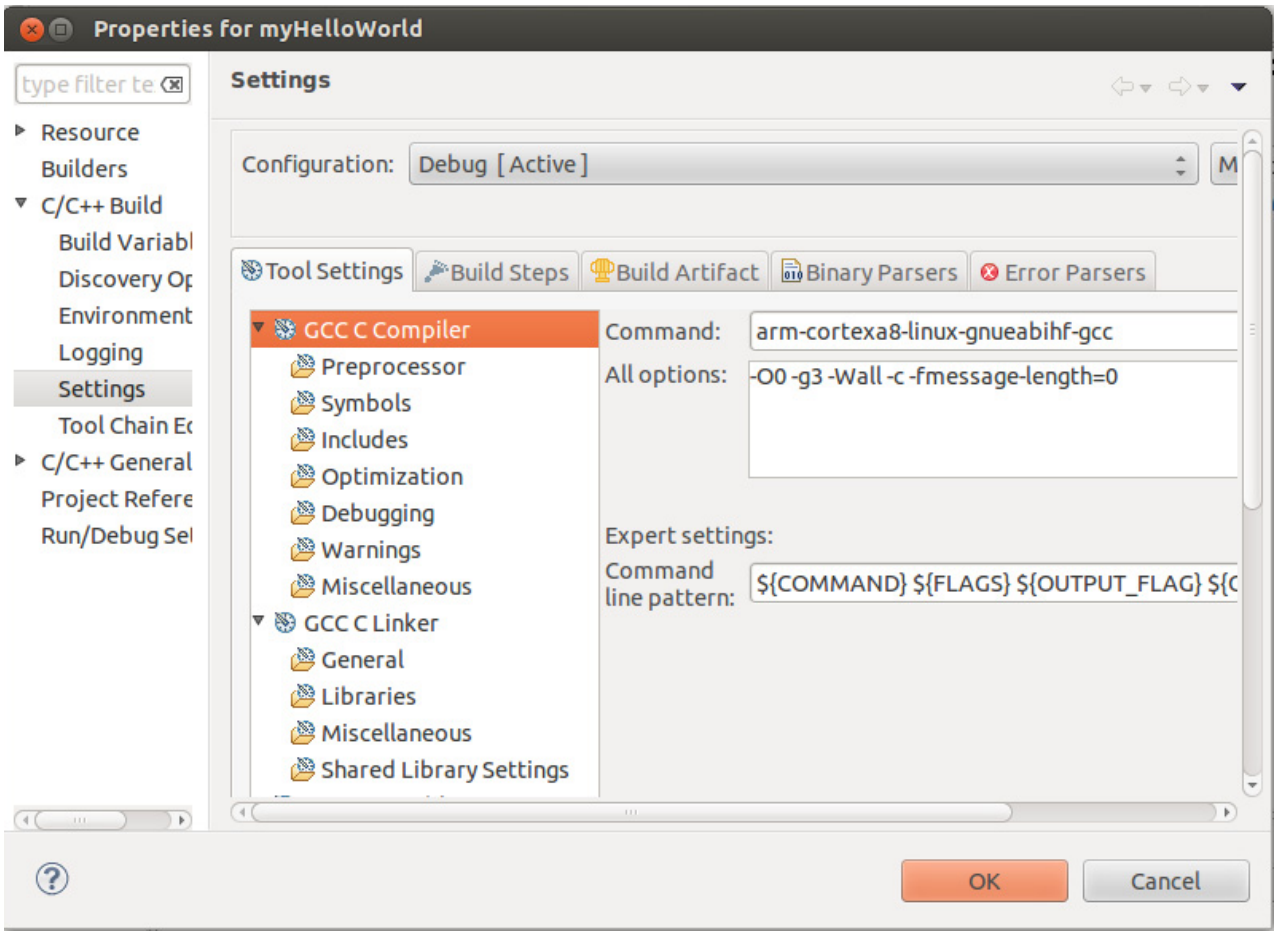
If *Build Automatically* from the *Project* menu is selected, the *HelloWorld* application will now be compiled and created with the standard GCC C/C++ compiler suitable for your host machine. You will find the executable file, which can only run on your host system, in the *workspace/myHelloWorld/Debug* directory.

To compile your project for the phyFLEX-AM335x instead, you will have to use the GNU C/C++ cross compiler.

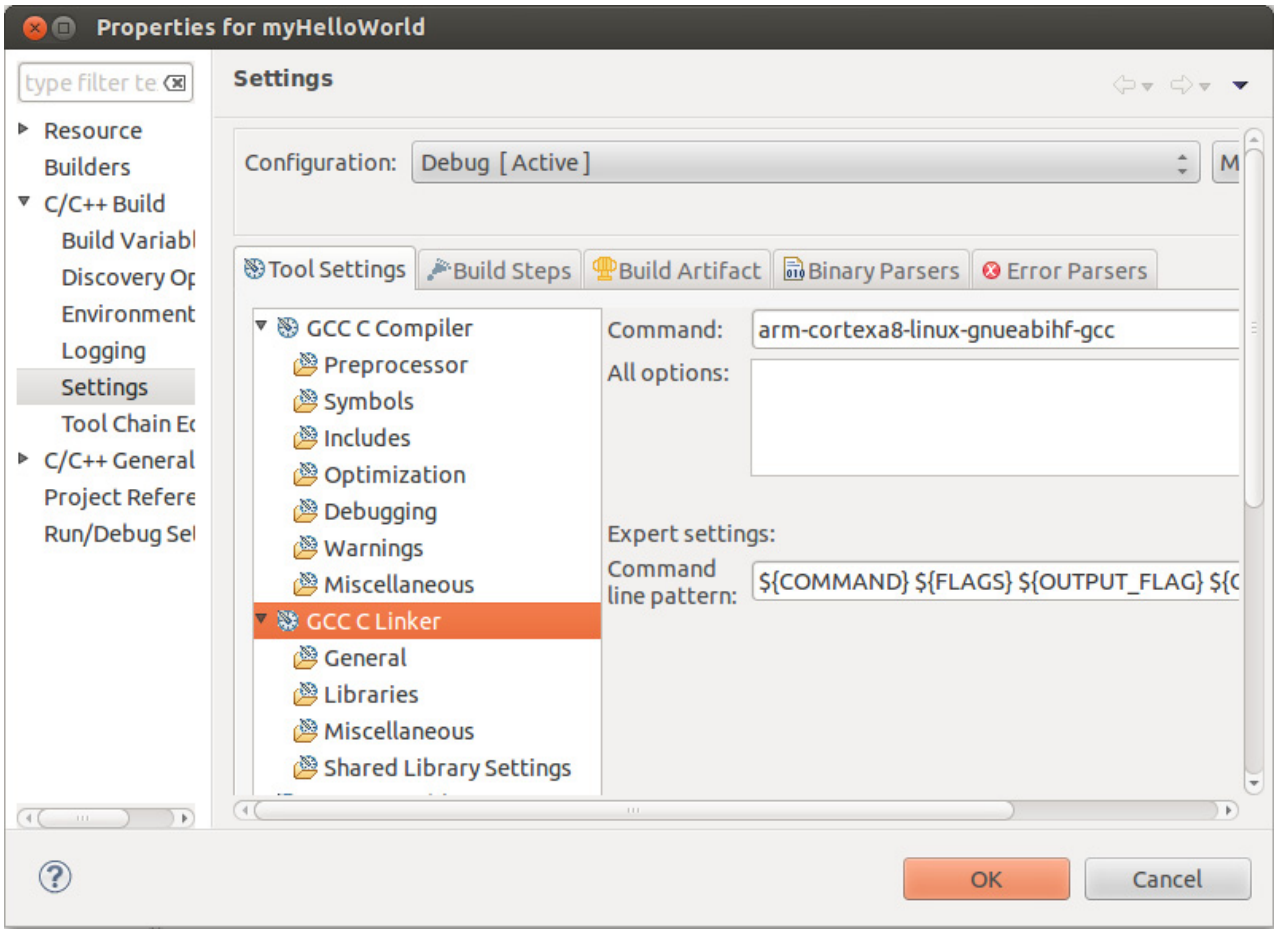
- Right-click the *myHelloWorld* project and choose *Properties*.

The *Properties* dialog appears.

- Select *C/C++ Build*.
- Enter **arm-cortexa8-linux-gnueabihf-gcc** into the *Command* input field.



- Select *GCC C Linker*.
- Enter **arm-cortexa8-linux-gnueabihf-gcc** into the *Command* input field.



- Select *GCC Assembler*.
- In the *Command* input field, change the default **as** to **arm-cortexa8-linux-gnueabihf-as**.

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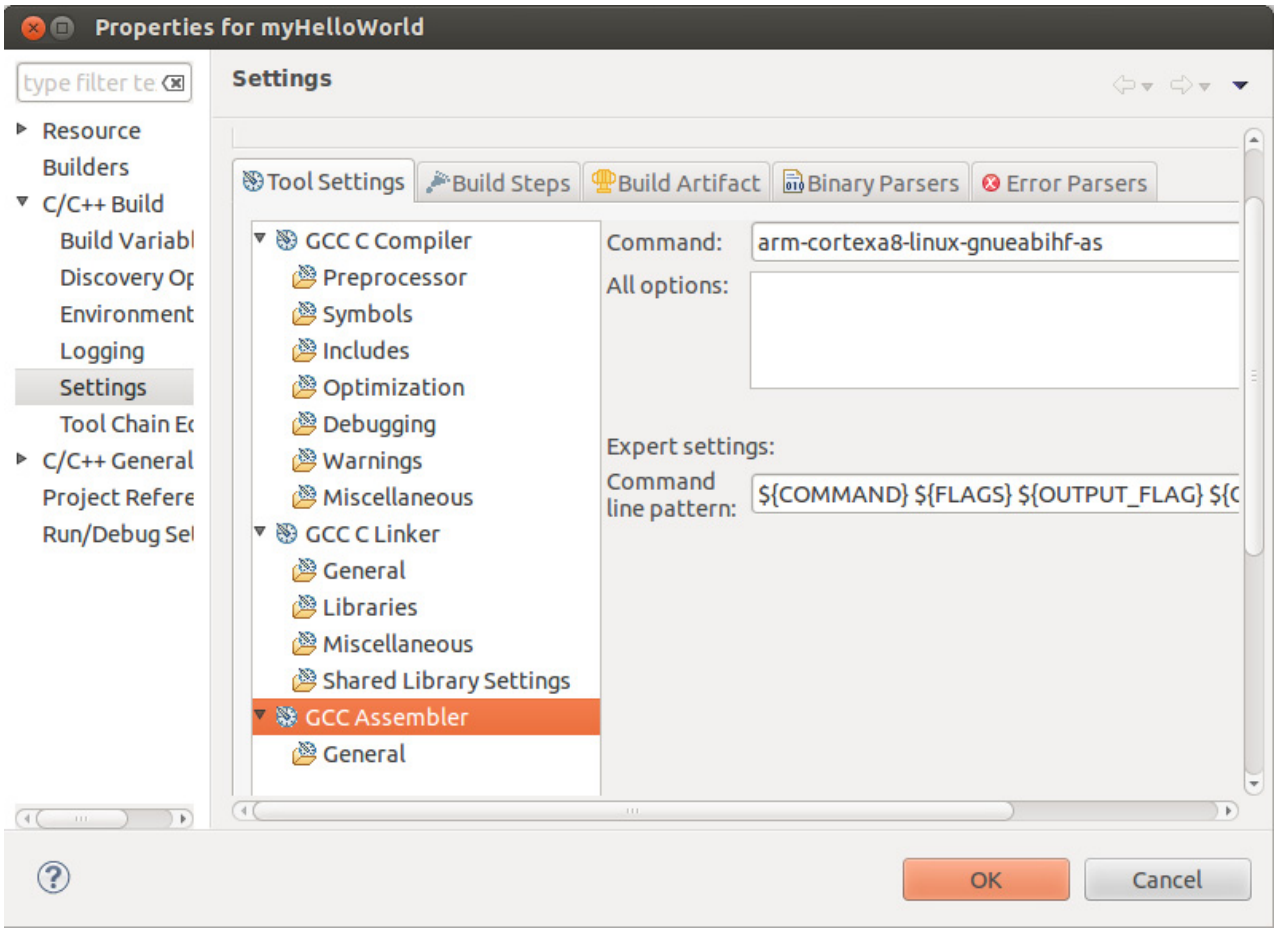
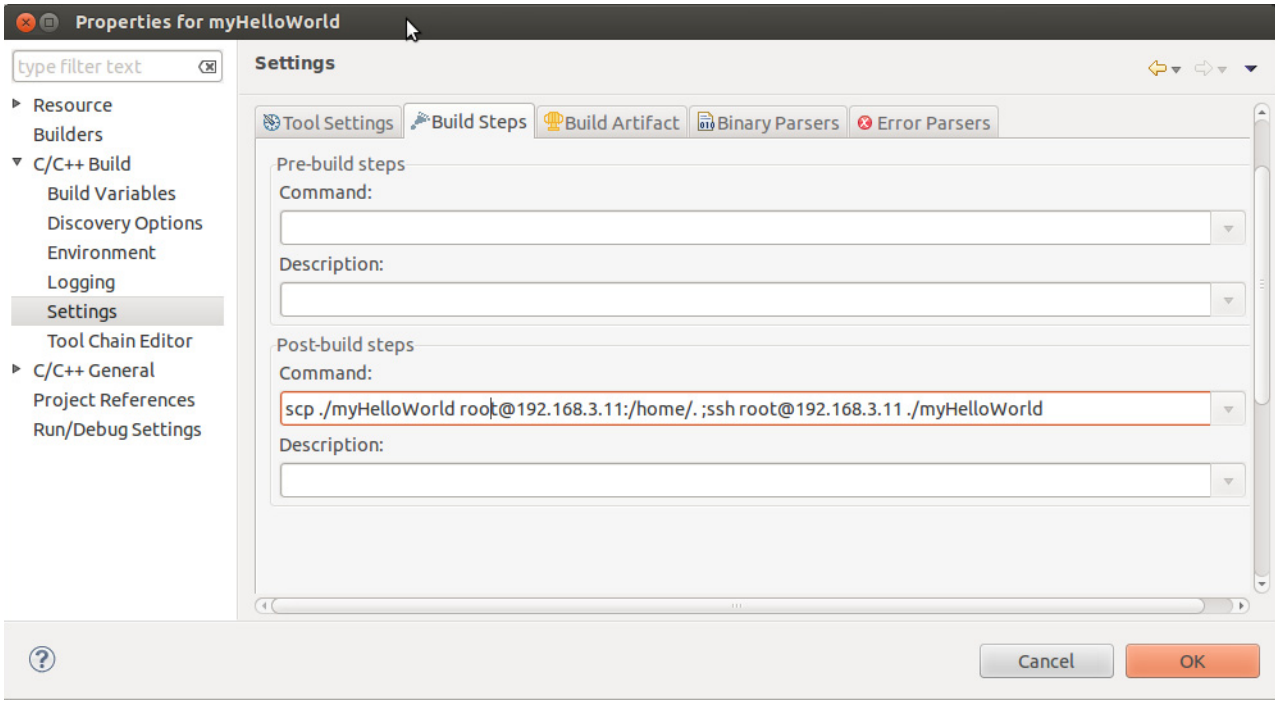
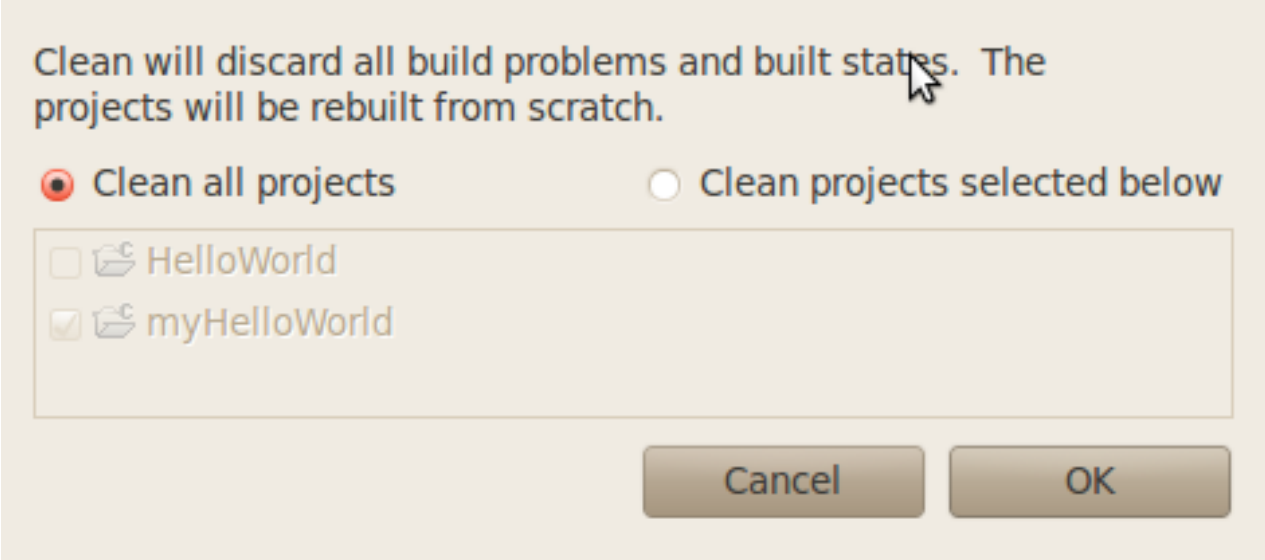


- Click *Apply*.
- Select the *Build Steps* tab.
- Enter the following command in the Post-build steps *Command* input field:
  scp ./myHelloWorld root@192.168.3.11:/home/. ;ssh root@192.168.3.11 ./myHelloWorld



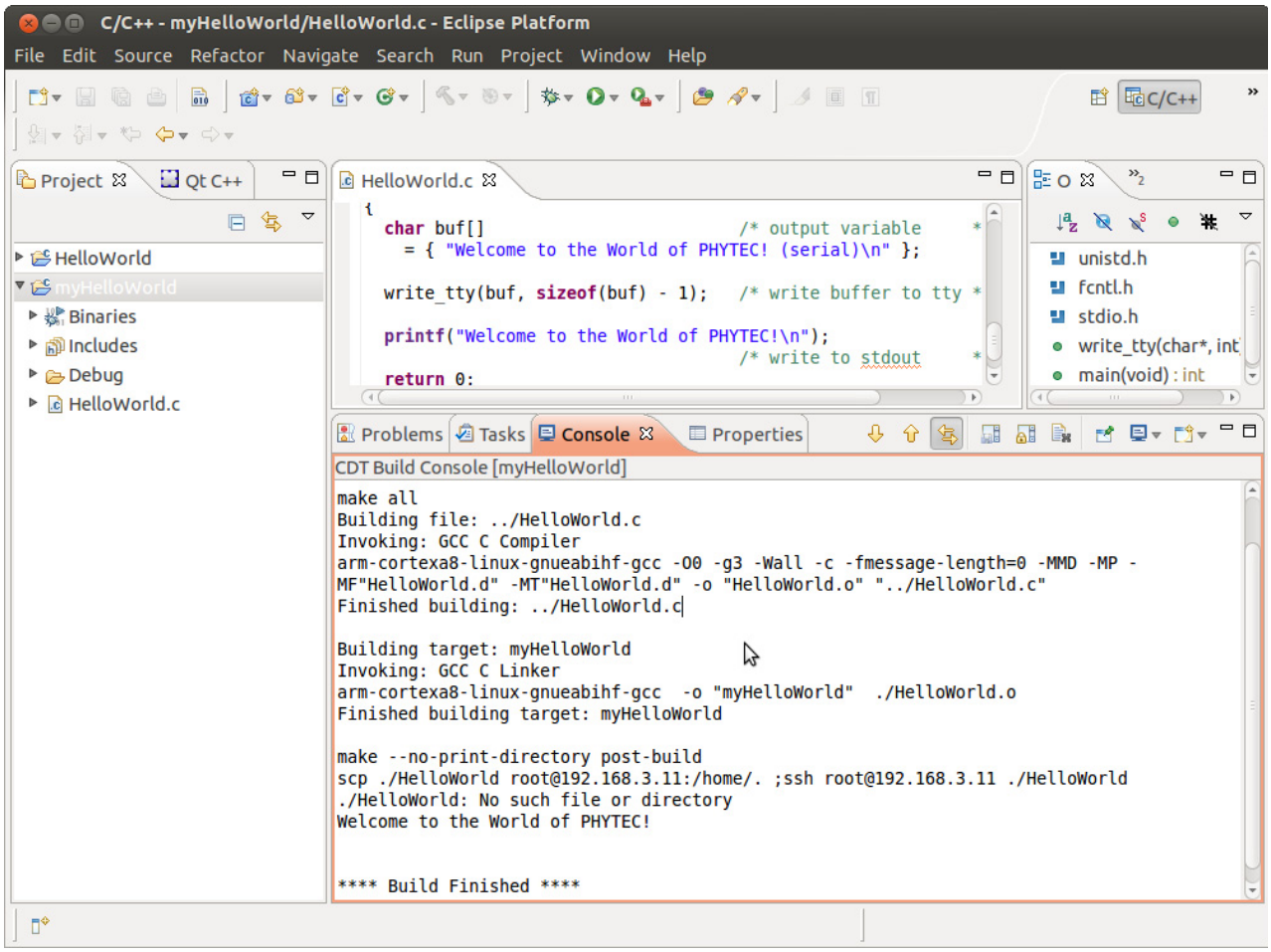
Be sure to enter the semicolon before the ssh command.
Be sure that the file *myHelloWorld* on the target will have execution rights, because otherwise *ssh* will fail.

- Click *Apply*.
- Click *OK*.
- Select *Project* ► *Clean* from the menu bar.



- Confirm with *OK*.
  The project will be rebuilt.
- Select the *Console* tab.

If no errors occur while building the project, you will see the following output:



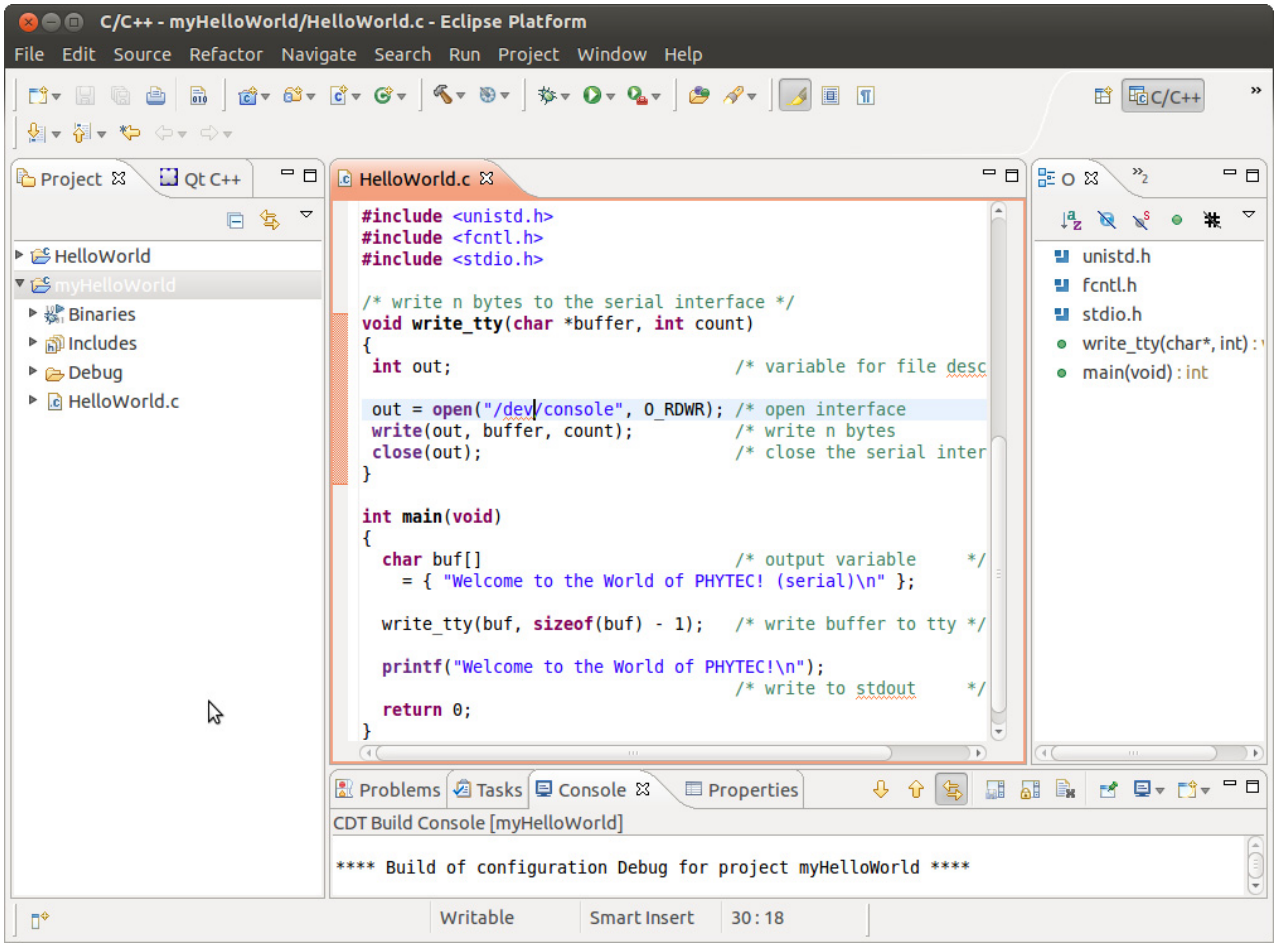
You have successfully created your first own project with the Eclipse IDE. You have configured the project to create an application for your target platform.

4.1.3 Changing the Demo Application

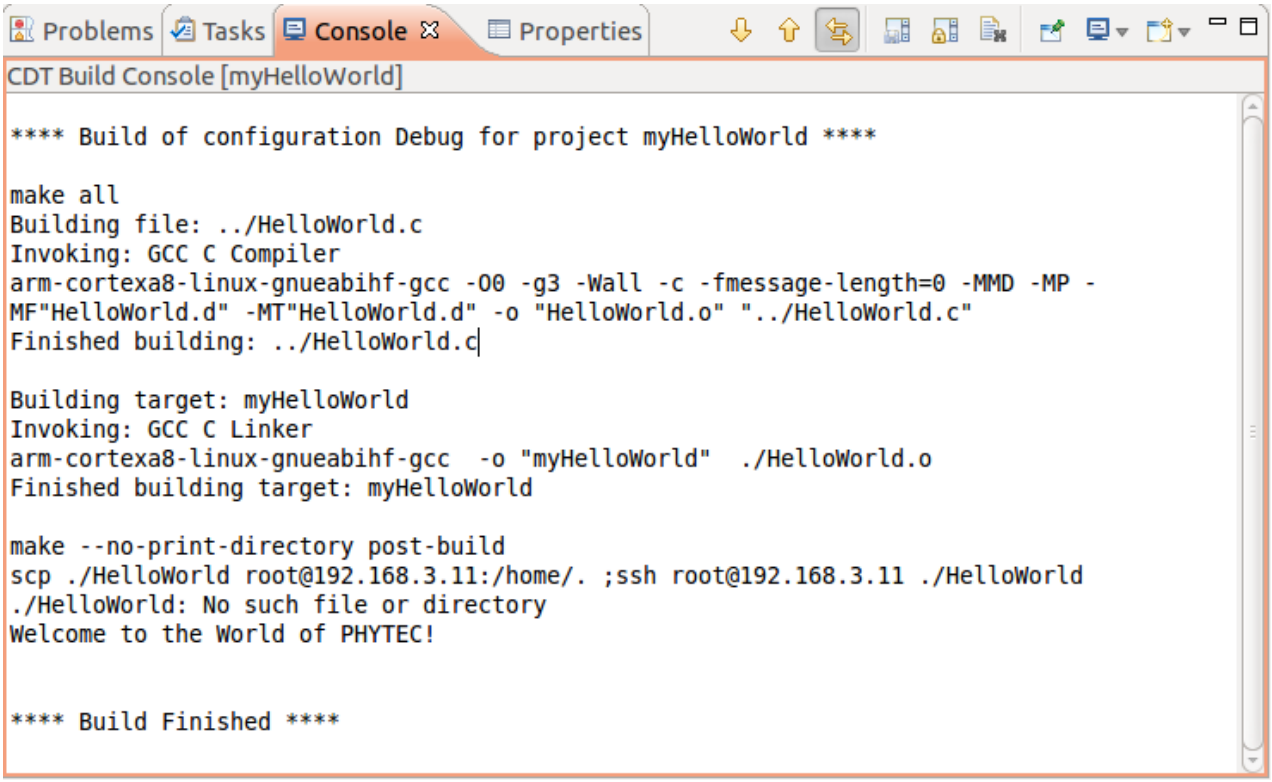
Now we will extend the *myHelloWorld* application. The extended *myHelloWorld* application will write an output to the first serial interface as well as to the standard output.

- Open Eclipse if it is not opened yet.
- Double-click *HelloWorld.c* in the *myHelloWorld* project.
- First include the following two additional header files:
  #include <unistd.h>
  #include <fcntl.h>
- Then add the function *write_tty()*, which writes *n* bytes to the first serial interface (which, on the phyFLEX-AM335x, is connected to the system console */dev/console*):
  *void write_tty (char *buffer, int count) {*
  int out;
  out = open ("/dev/console", O_RDWR);
  write(out, buffer, count);
  close(out);
  }
- Enter the following tow lines in the *main()* function to declare the buffer and call the *write_tty()* function.
  char buf [] = { "Welcome to the World of PHYTEC! (serial)\n" };
  write_tty(buf, sizeof (buf) - 1);

In the next screenshot you can see the complete program.



- Save your program after changing the code.
  The application will be compiled, built, copied to the target and executed.



- Click the *Microcom* icon on the desktop.
- If you are not logged in, enter **root** and press *Enter*.
- Type *./myHelloWorld* to start the application.
- You will see the following output:
  Welcome to the World of PHYTEC! (serial)
  Welcome to the World of PHYTEC!
- Close Microcom.

When you start the application via an SSH session, you only see one output line. When you execute the program with Microcom, you see two output lines.

The first line is a direct output on the serial interface. You can't see this line in a SSH session, because you are connected over a TCP/IP connection to the target. With Microcom, however, you have direct access to the serial interface, so you can also see the line that is written to the serial console.

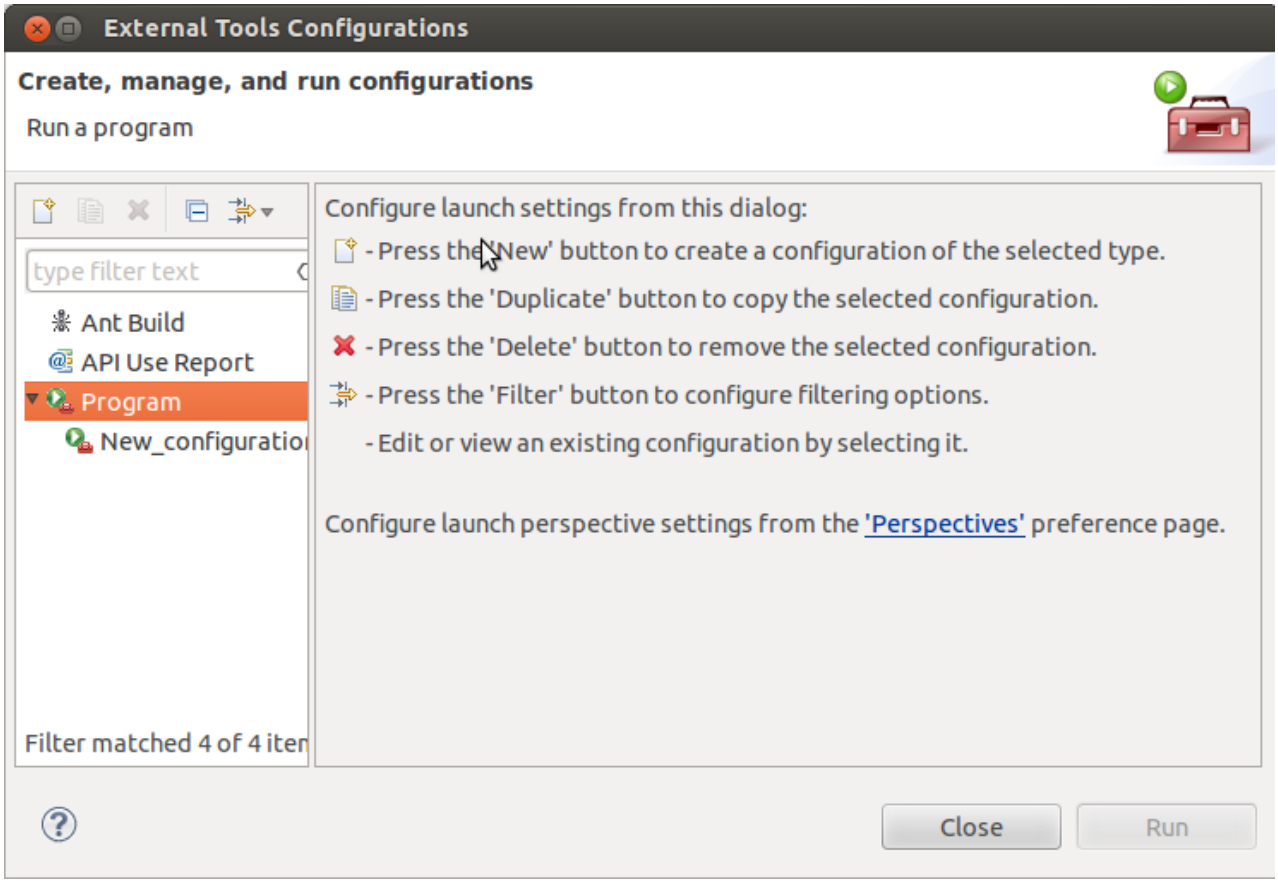
In this section you have changed an existing application. You also learned how to access the serial interface. First you called the function *open()* on the device */dev/console*. The return value of this function was a file descriptor. With the file descriptor you called the function *write()* to send *n* bytes to the device */dev/console*. After that, the file descriptor was closed with the function *close()*.

This procedure is in principle quite typical for Linux, because Linux treats everything like a file.

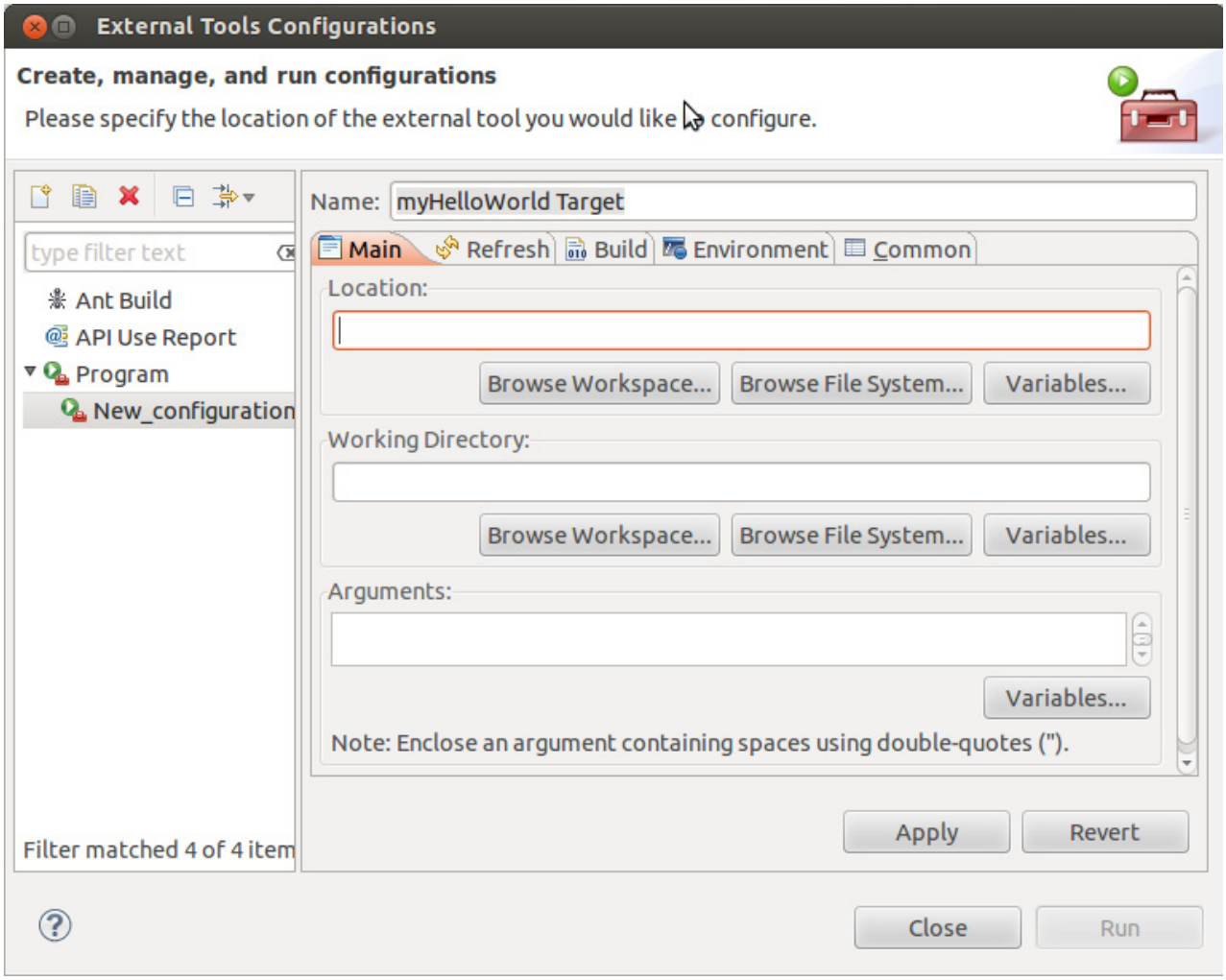
4.1.4 Starting a Program out of Eclipse on the Target

After compiling a project in Eclipse, the program is copied to the target and directly executed. A program can also be executed on the target without compiling a project. In the following section you will learn how to start a program on the target as an external tool.

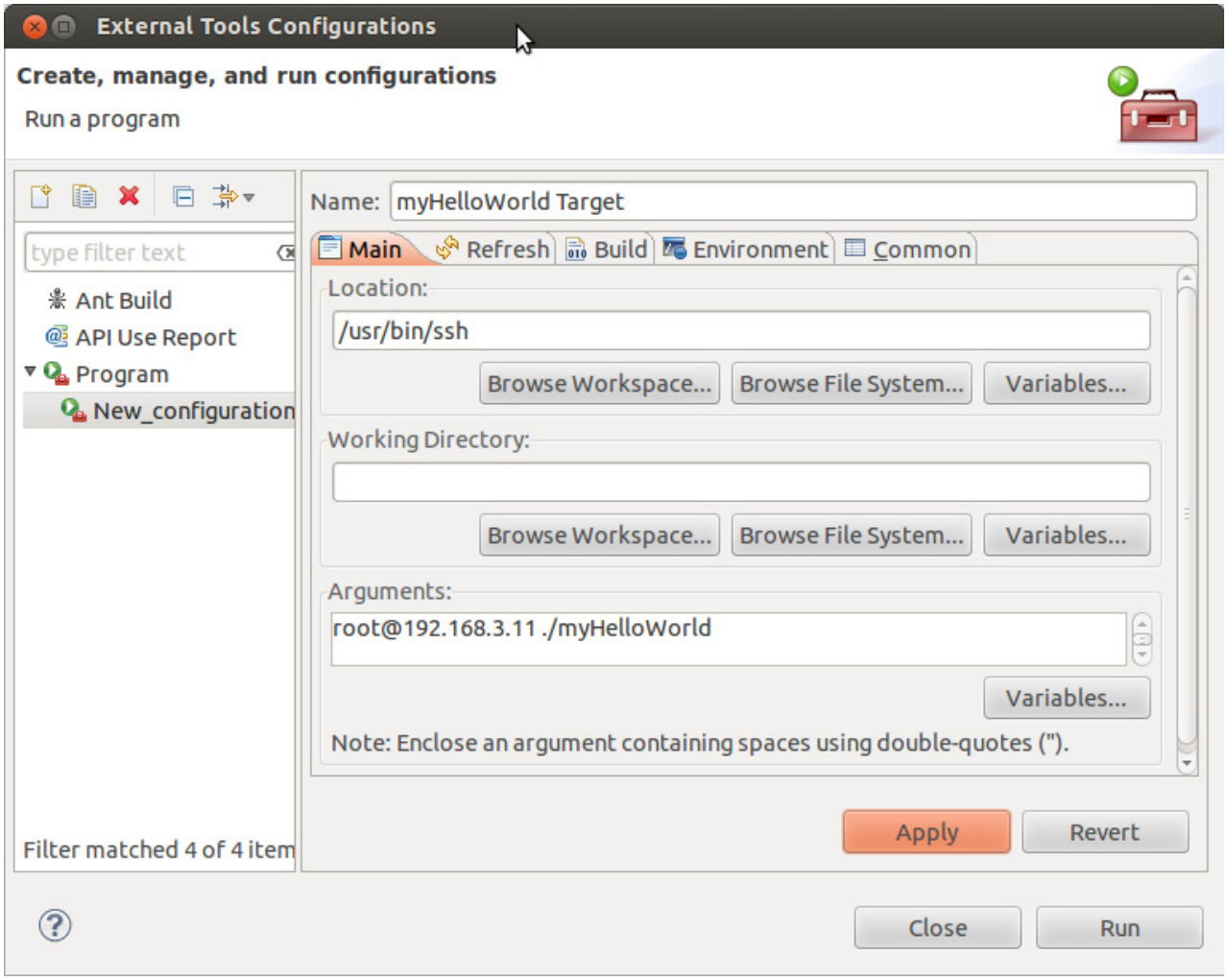
- Select *Run* ▶ *External Tools* ▶ *External Tools Configurations* from the menu bar.



- Under *Program* select *New_configuration (1)*.

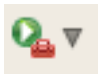


- In the *Name* input field, enter: **myHelloWorld Target**.
- Enter **/usr/bin/ssh** in the *Location* input field.
- Enter **root@192.168.3.11 ./myHelloWorld** into the *Arguments* field.
- Select *Apply*.



- Select *Run*.

If you want to execute the program the next time, you can use the *Run External Programs*



button from the menu bar.

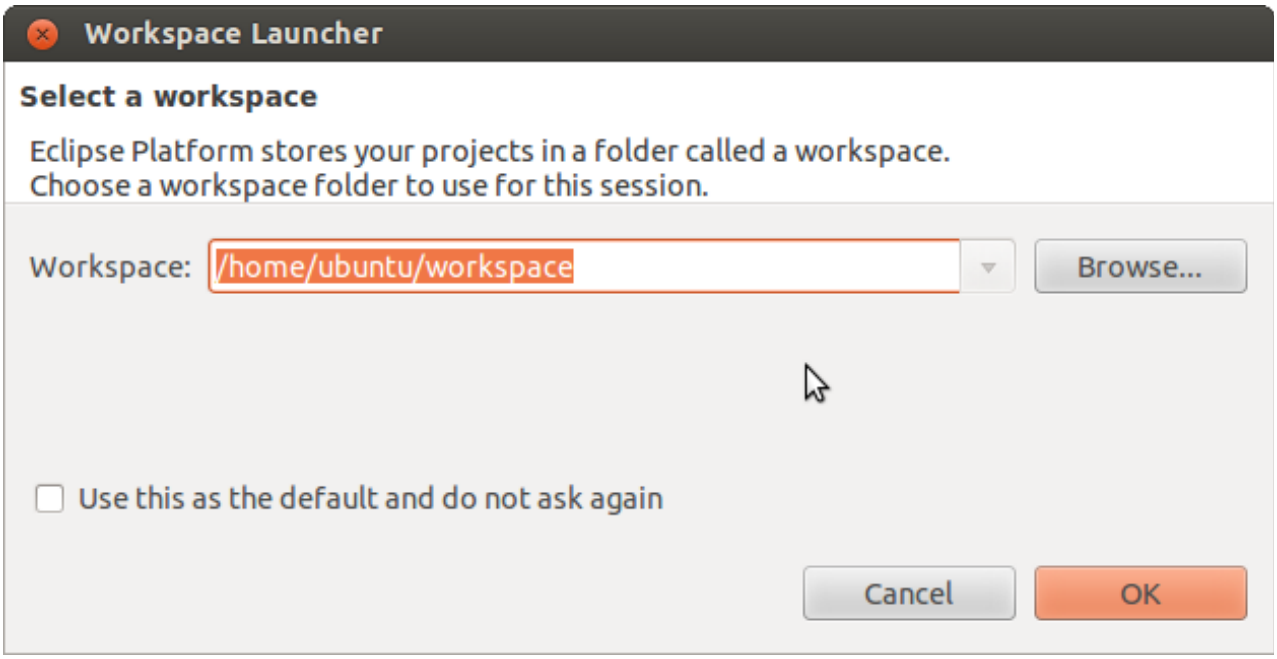
You have successfully create your own Eclipse project and you learned how to execute a program at the target.

4.2 Programming in the Qt C++ perspective

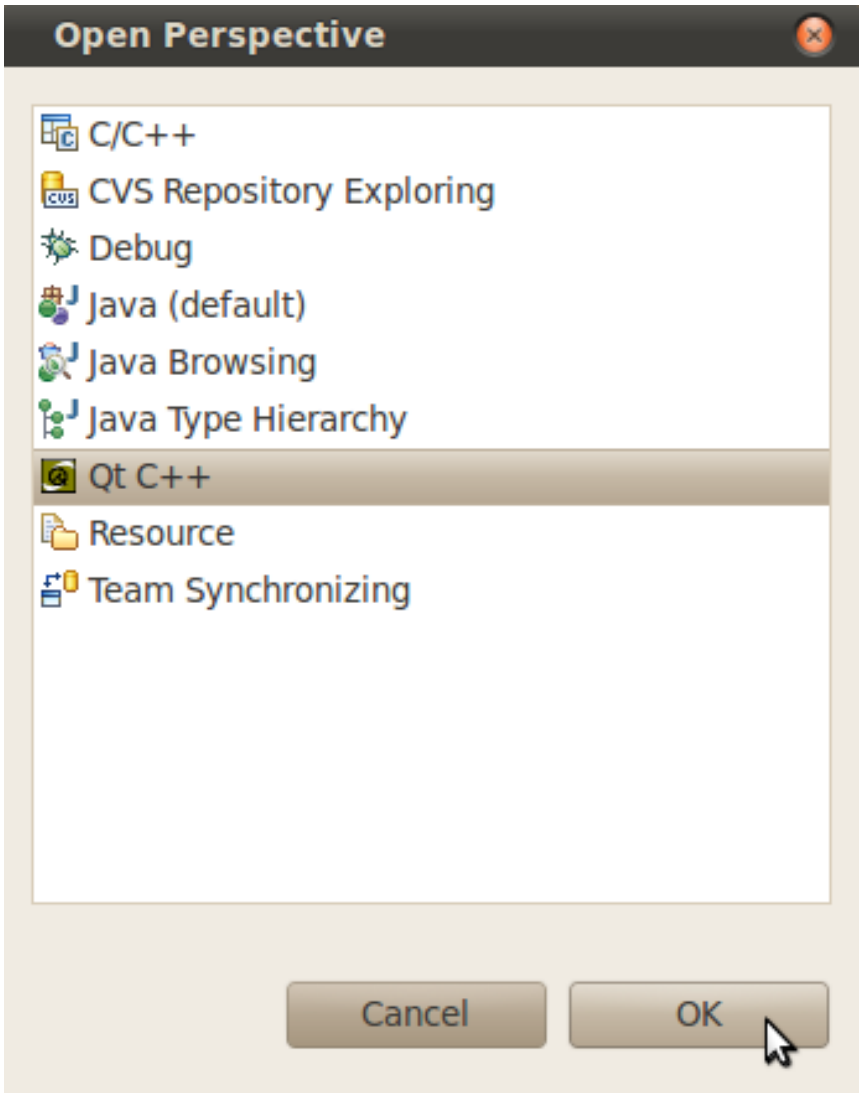
In this section our attention goes to the Qt framework, which gives us tools to develop graphical user interfaces. With the help of an example project we will give you a short introduction of how to work with Qt.

4.2.1 Importing the demo application

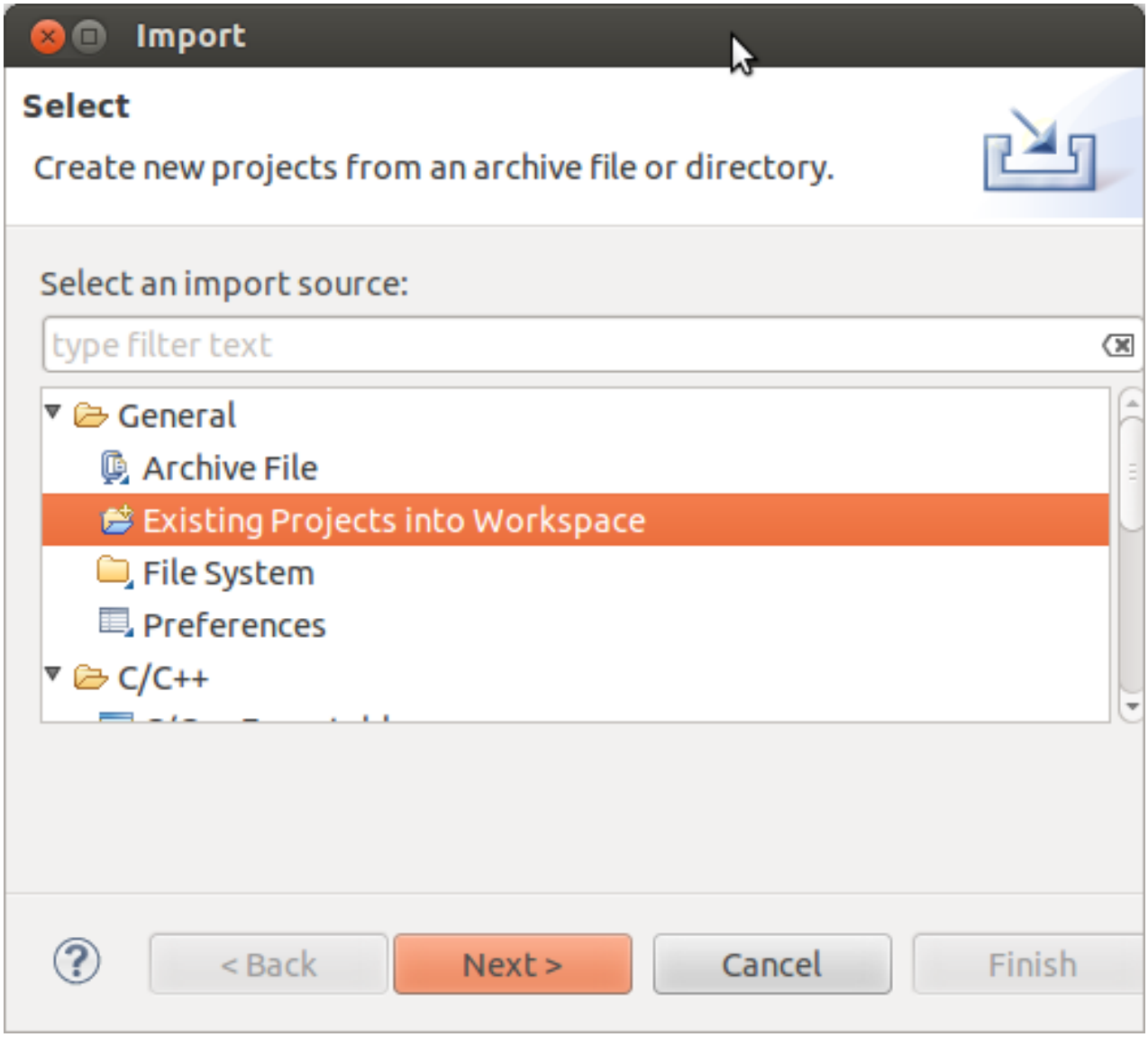
- Click the Eclipse icon to start the application, if it isn't already open. You can find this icon on your desktop.



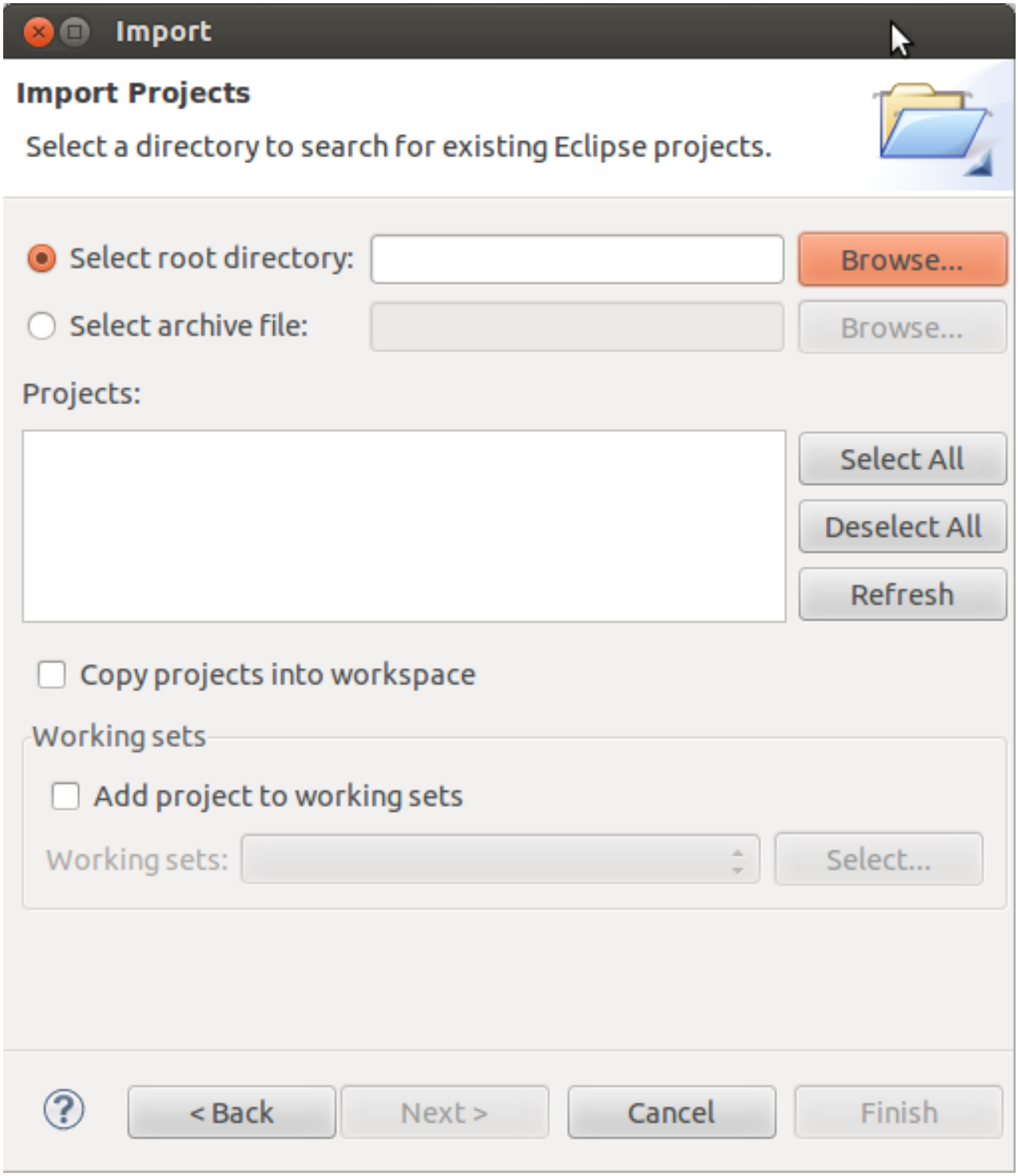
- Now we switch to the Qt C++ perspective. Click *Window* ▶ *Open Perspective* ▶ *Other*.



- A dialog opens. Choose *Qt C++* and click **OK**.
- Now we can import the example project. Select *File* ► *Import* from the menu bar.



- Select *Existing Projects into Workspace*.
- Click *Next*.



- Select *Browse*.
- Double-click the *FullScreen* directory under */home/ubuntu/workspace/*.

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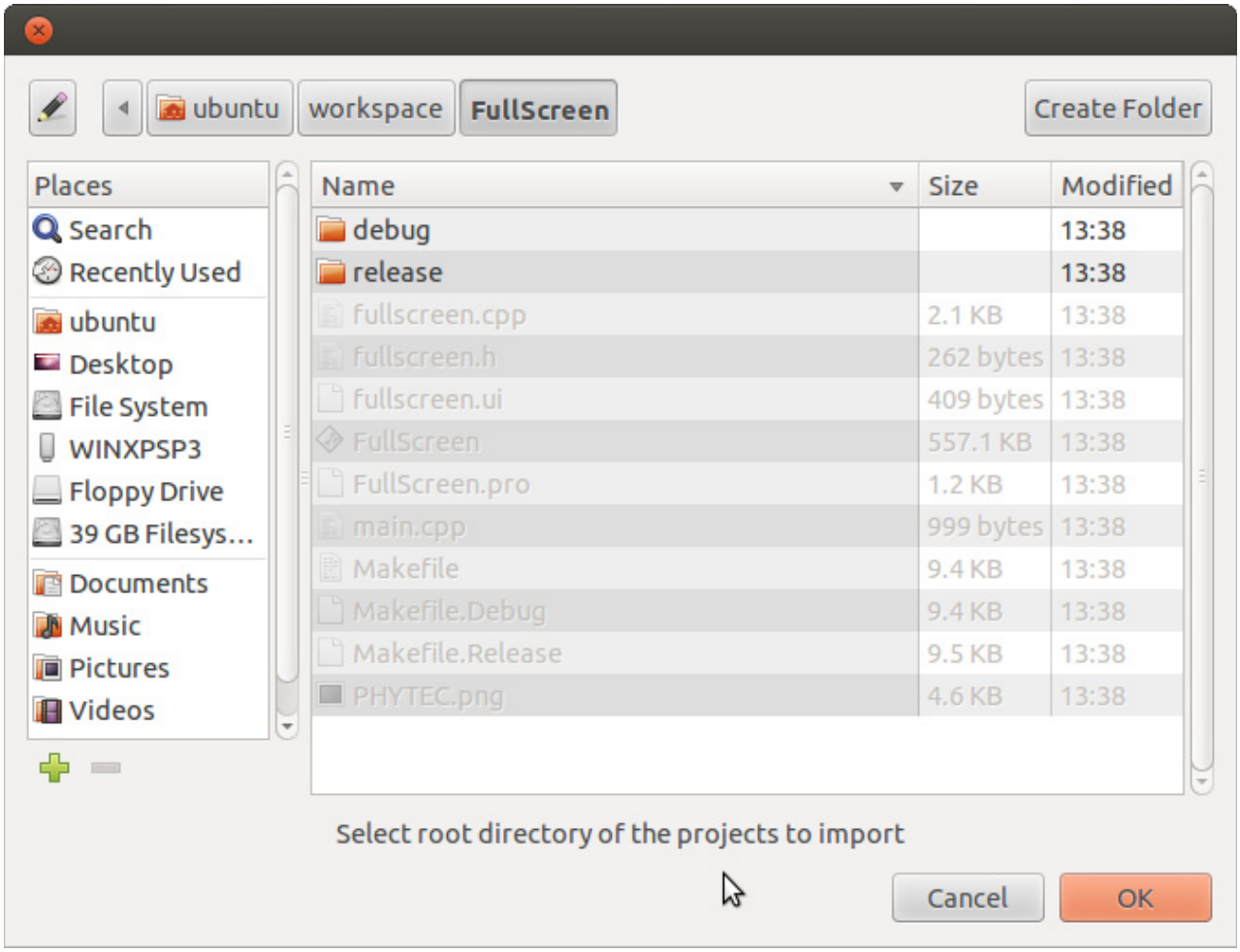
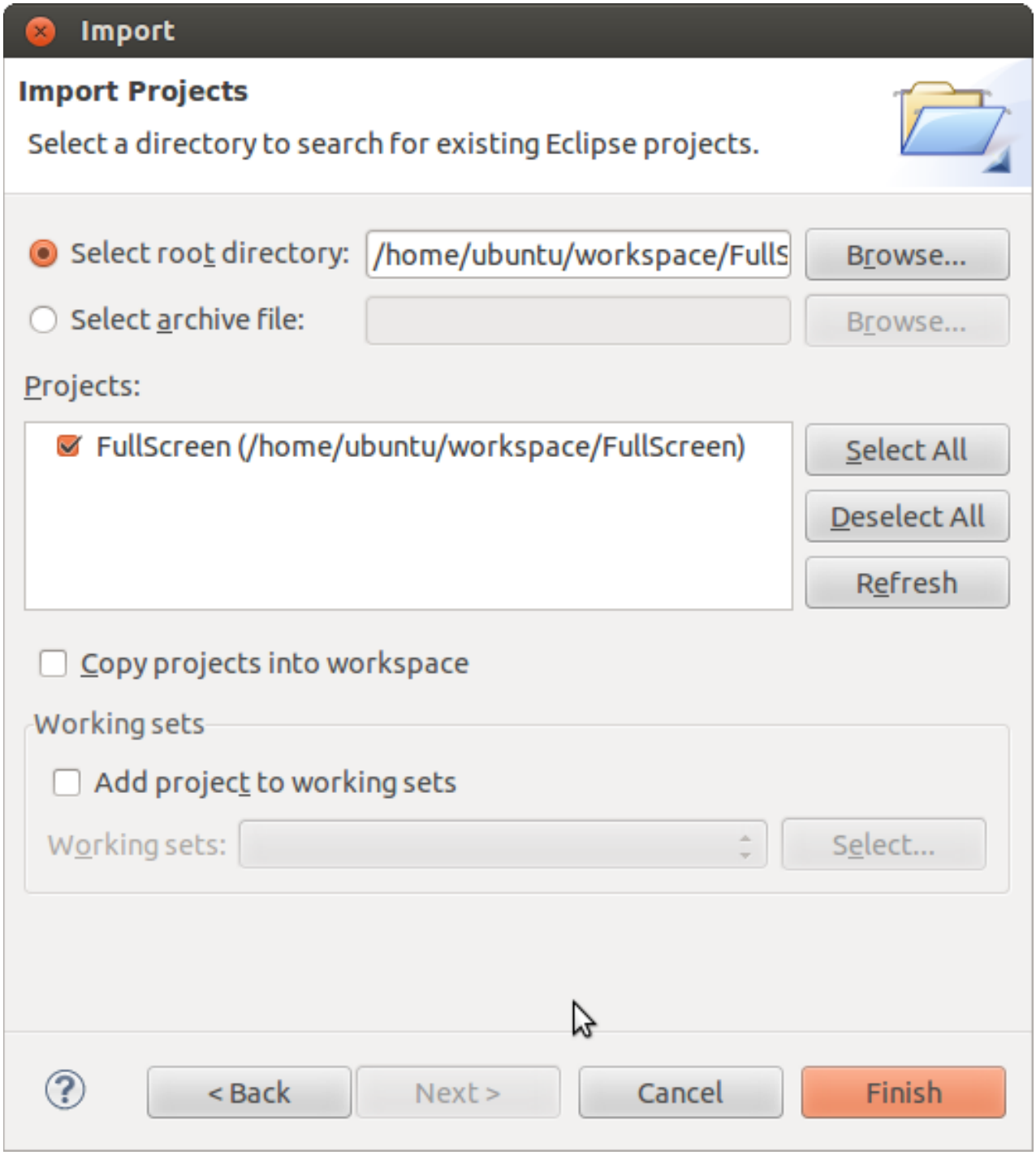
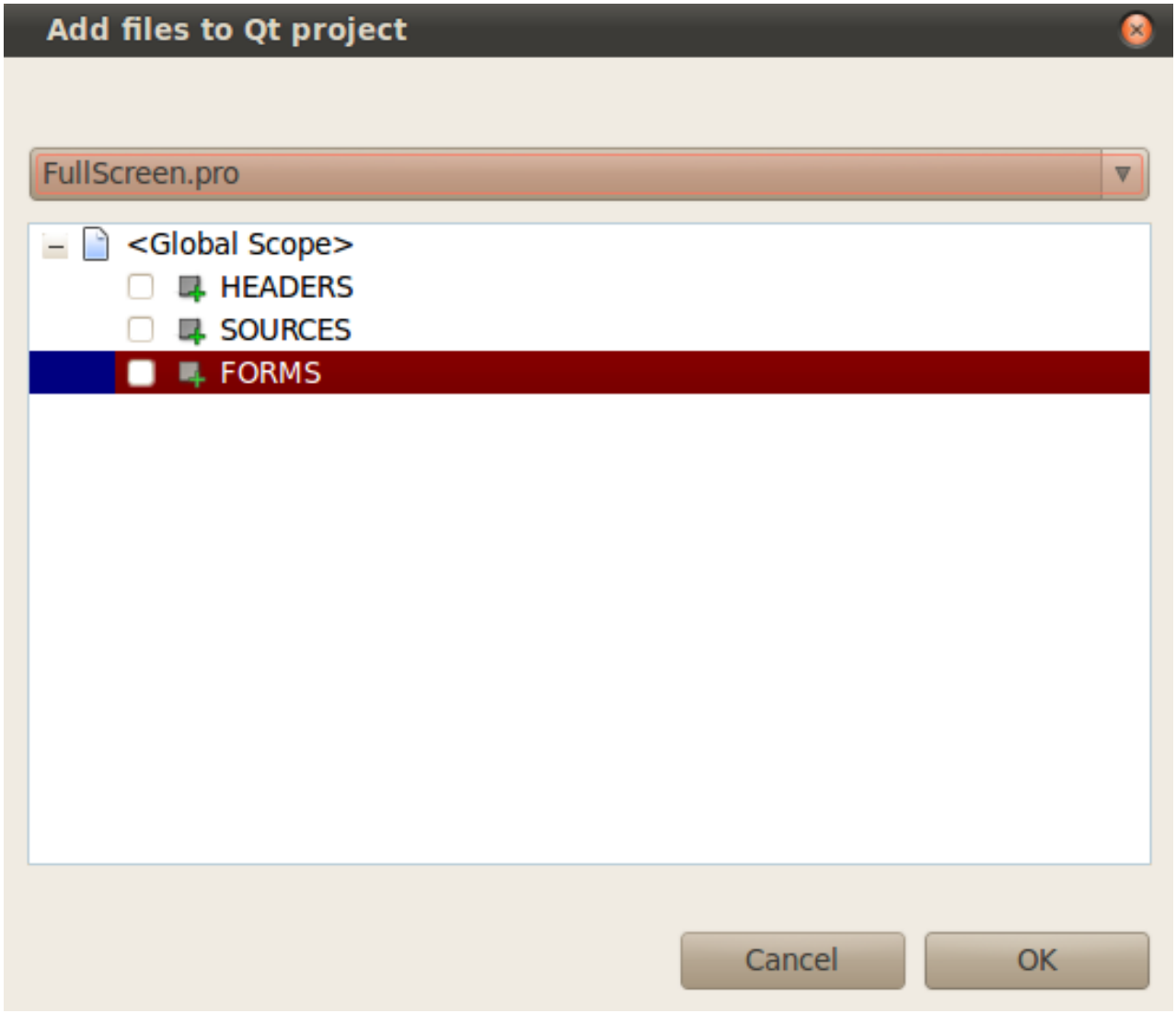

ubuntu
workspace
FullScreen
Create Folder
Places
Search
Recently Used
ubuntu
Desktop
File System
WINXPSP3
Floppy Drive
39 GB Filesys...
Documents
Music
Pictures
Videos
Name
Size
Modified
debug
13:38
release
13:38
fullscreen.cpp
2.1 KB
13:38
fullscreen.h
262 bytes
13:38
fullscreen.ui
409 bytes
13:38
FullScreen
557.1 KB
13:38
FullScreen.pro
1.2 KB
13:38
main.cpp
999 bytes
13:38
Makefile
9.4 KB
13:38
Makefile.Debug
9.4 KB
13:38
Makefile.Release
9.5 KB
13:38
PHYTEC.png
4.6 KB
13:38
Select root directory of the projects to import
Cancel
OK

- Click *OK*.



- Select *Finish* to import the project.
- On the next window **deselect** *HEADERS* and *FORMS* and click *OK*.



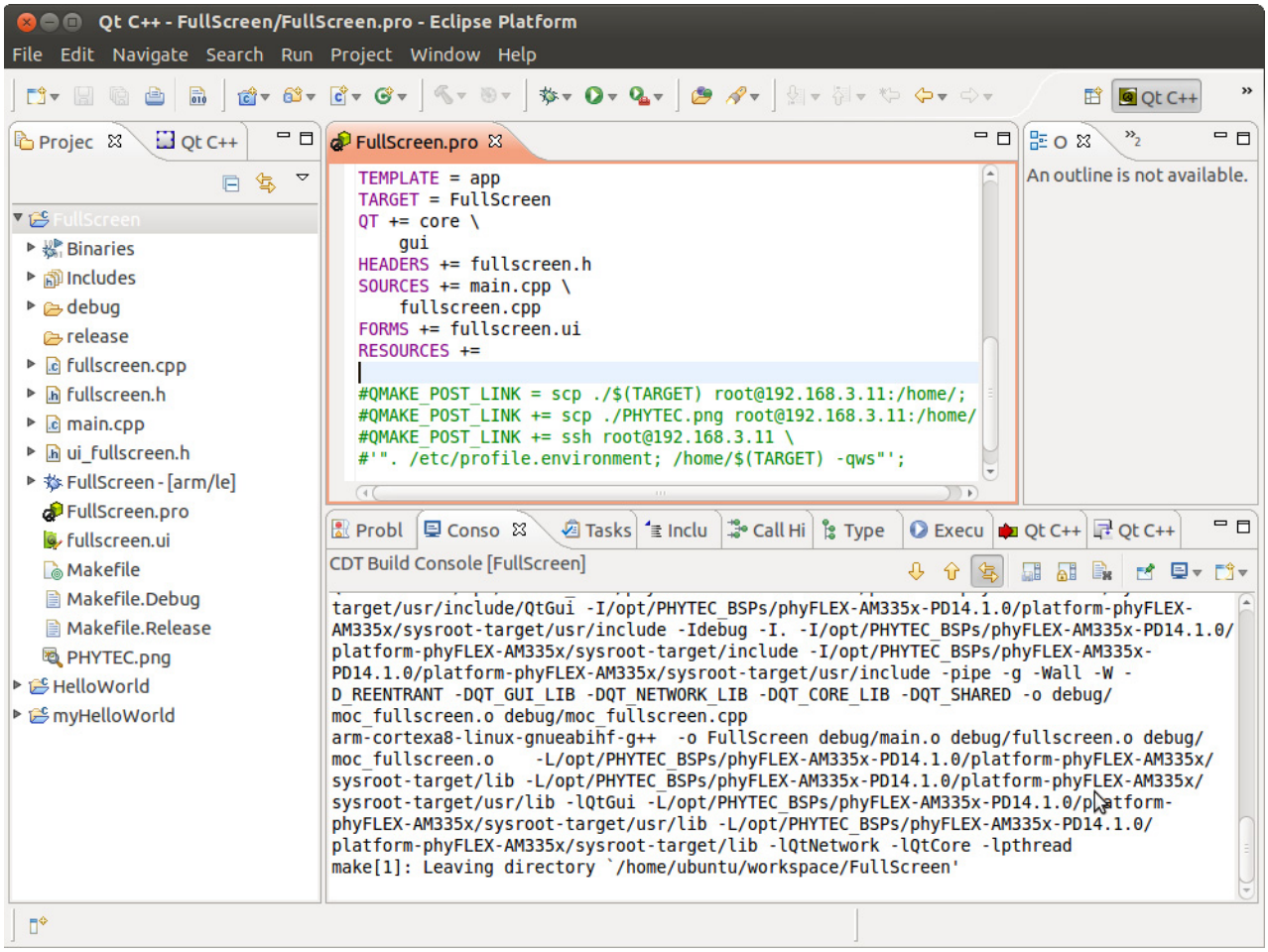
The *FullScreen* program will be compiled and you can find the outputs on the console. After the compilation is finished successfully the *FullScreen* executable for the target is built and can be found under */home/ubuntu/workspace/FullScreen*.

If the project is not built automatically, you will have to check *Project* ► *Build automatically* in the menu bar. To rebuild select *Project* ► *Clean...* .

4.2.2 Handle with the demo application

If you want the project to be automatically copied to the target and executed we must make some changes in the *FullScreen.pro* file.

- Double-click the *FullScreen.pro* to open it.



At the end of this file you will find four uncommented rows.

- Remove the commentar signs (**#**) to enable the three *QMAKE_POST_LINK* tags. With this tag you can add post-build commands. In our case we copy the compiled project and the picture to the target and connect via *ssh*, set the environment and execute the application.
- Before we clean and build the project, be sure that no other QT application is started on the target (for example the *Fluidlauncher* from the autostart).
- Select *Project* ▶ *Clean...*.
- Confirm the Clean dialog with *OK*.

After the FullScreen program is compiled the QMAKE_POST_LINK is called. The *FullScreen* file is copied to the target using secure copy and executed using *SSH*.

On the display of the target the project is started and you can change between windowed and fullscreen mode by clicking the button. By touching the **X** you can close the program.

You have successfully imported and built a Qt project in Eclipse. You've also learned to run your application on the target.

5 Debugging an example project

35 min

In this chapter you will learn using the GNU debugger GDB on the host for remote debugging in conjunction with the GDB server on the target. GDB is the symbolic debugger of the GNU project and is arguably the most important debugging tool for any Linux system.

First you will start the GDB server on the target. Then you will configure the Eclipse platform and start the GNU debugger out of Eclipse using the Debug view.

The CDT extends the standard Eclipse Debug view with functions for debugging C/C++ code. The Debug view allows you to manage the debugging and running of a program in the workbench. Using the Debug view you will be able to set breakpoints/watchpoints in the code and trace variables and registers. The Debug view displays the stack frame for the threads of each target you are debugging. Each thread in your program appears as a node in the tree, and the Debug view displays the process for each target you are running.

The GDB client is running on the host and is used to control the GDB server on the target, which in turn controls the application running on the target. GDB client and GDB server can communicate over a TCP/IP network connection as well as via a serial interface. In this Quickstart we will only describe debugging via TCP/IP.

5.1 Starting the GDB server on the target

In this passage you will learn how to start the GDB server on the target. The GDB server will be used to start and control the *myHelloWorld* program.

To debug a program with GDB, the program needs extended debugging symbols. This has already been added while building the program.

- Open Microcom.
- Type **root** and press **Enter**.
- Start the GDB server:
  gdbserver 192.168.3.11:10000 myHelloWorld
  You have started the GDB server on the target. The GDB server is now waiting for connections on TCP port 10000.

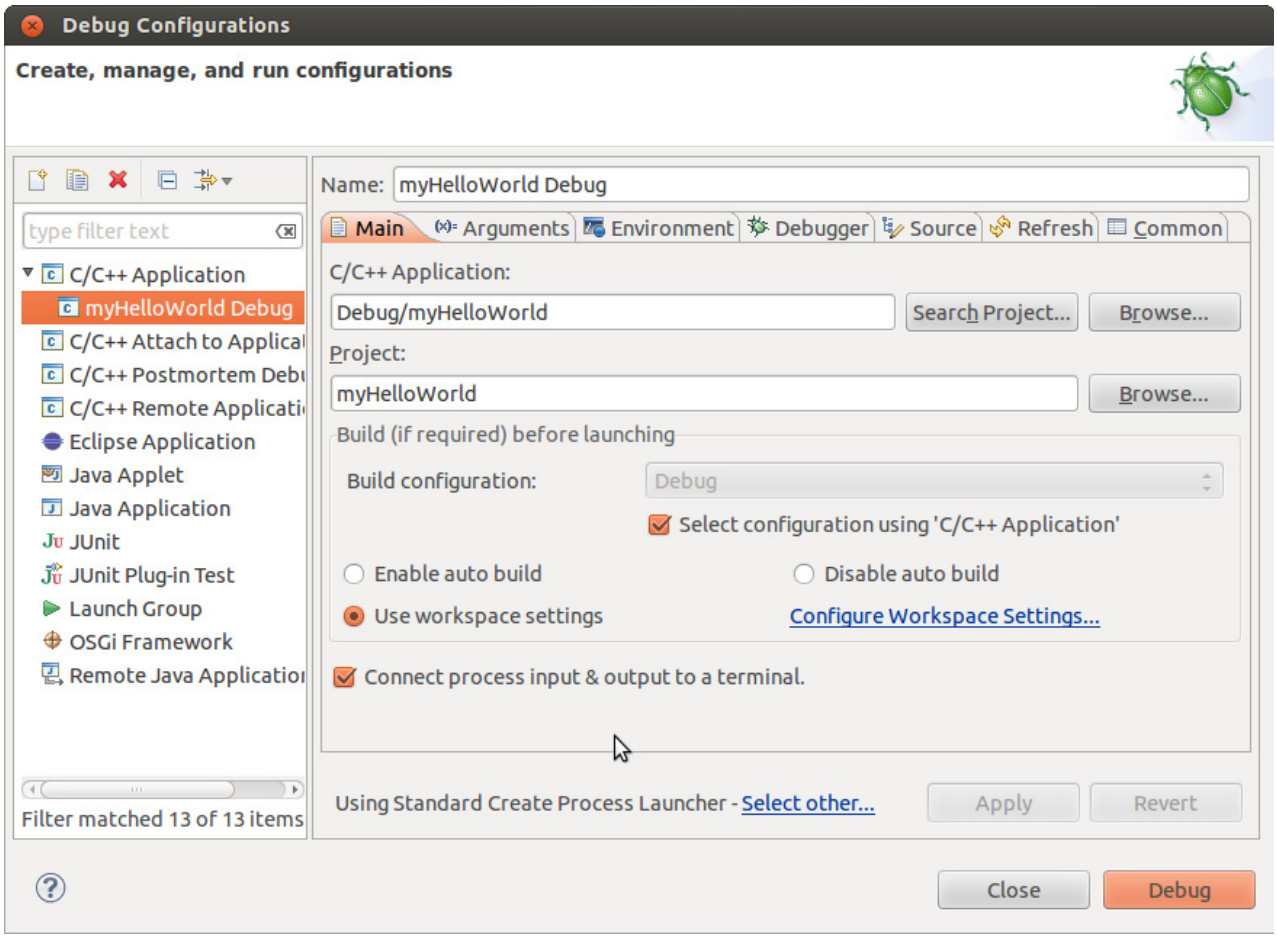
5.2 Configuring and starting the debugger in Eclipse

In this passage you will learn how to configure your project settings to use Eclipse with the GNU debugger. After the configuration of your project settings, the GNU debugger will start and connect to the GDB server on the target.

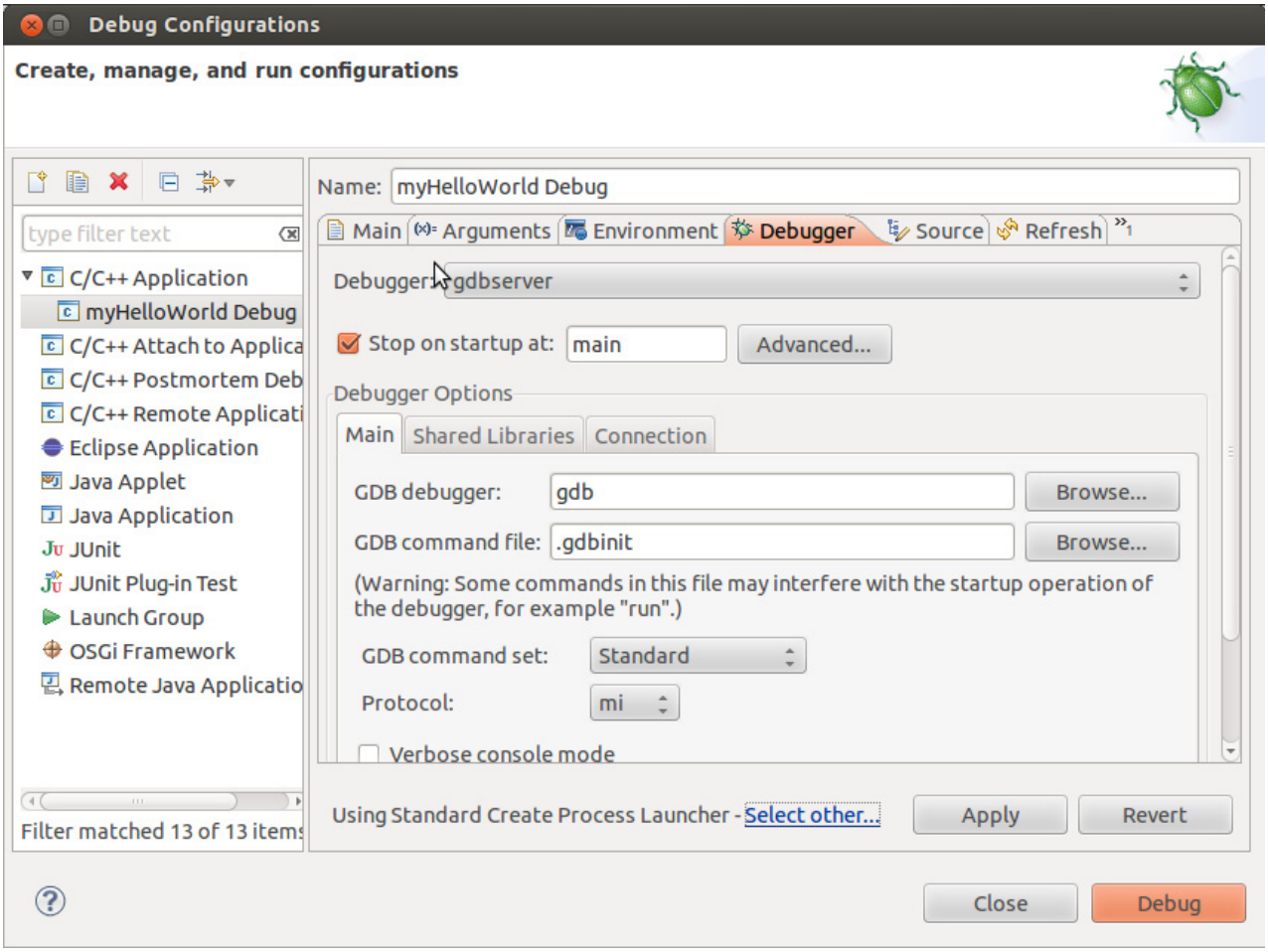
- Start Eclipse if the application is not started yet.
- Right-click on the *myHelloWorld* project in the *Navigator* window.
- Select *Debug As* ► *Debug Configurations*.

A dialog to create, manage and run applications appears.

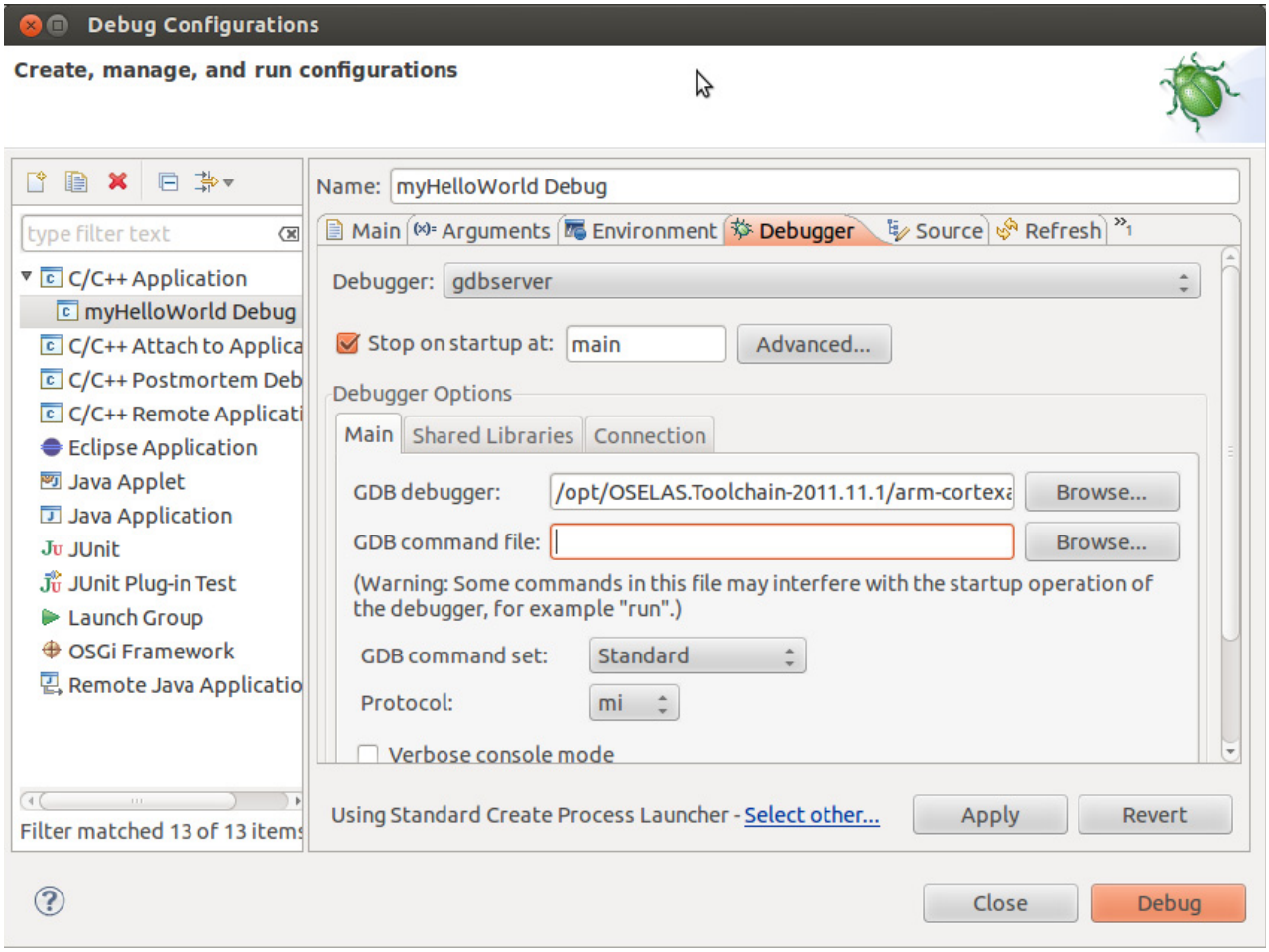
- Double-click on C/C++ Application and Select *myHelloWorld Debug*.



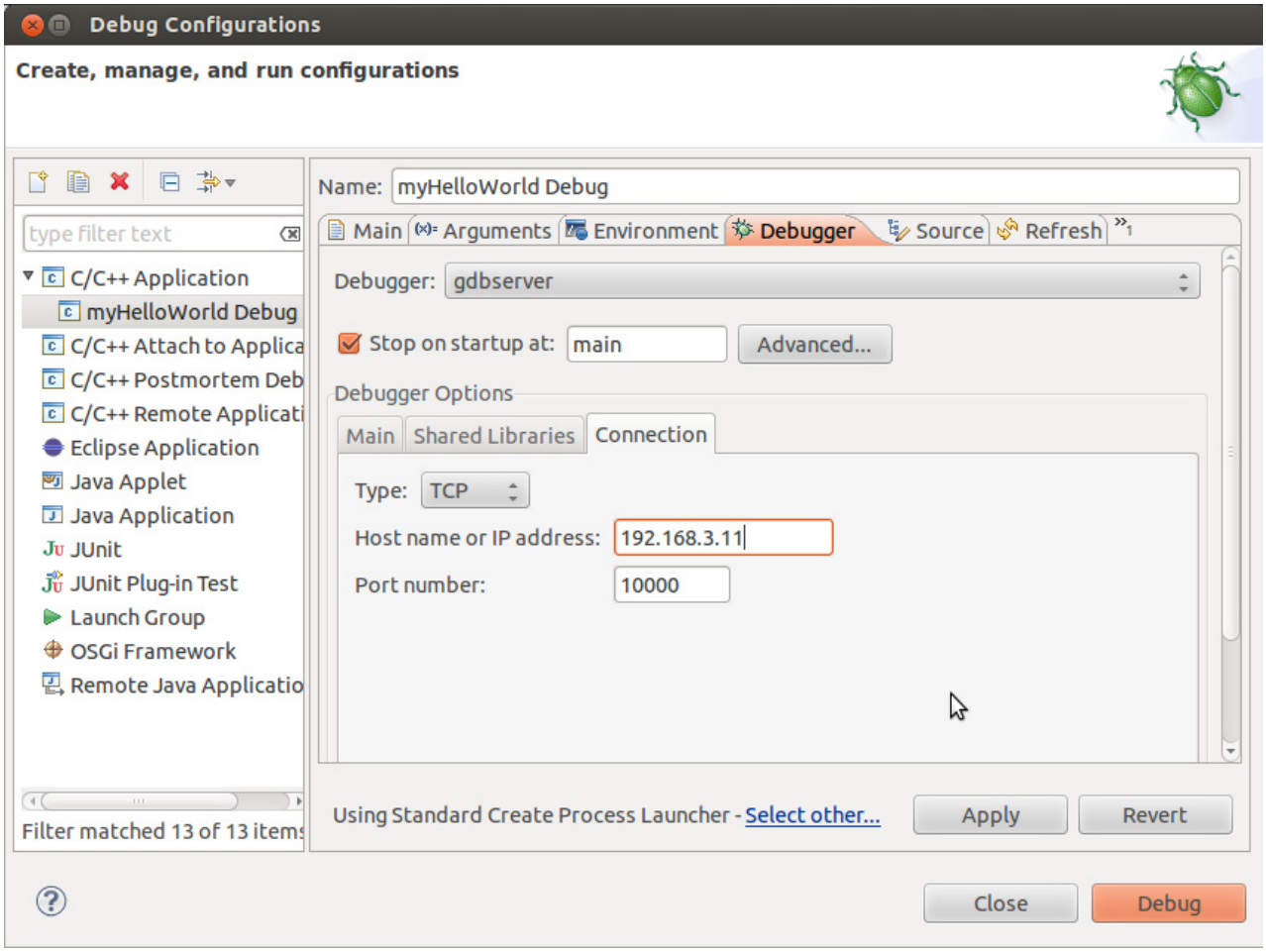
- Select the *Debugger* tab.



- Select *gdbserver Debugger* from the *Debugger* drop-down box.
- Click the *Browse* button right beside the *GDB debugger* input field.
  A new dialog opens to choose the GDB executable.
- Click on *File System*.
- Navigate to the directory */opt/OSELAS.Toolchain*/arm-cortexa8-linux-gnueabihf/gcc-4.7.3-glibc-2.22-binutils-2.22-kernel-3.6-sanitized/bin*.
- Select the file *arm-cortexa8-linux-gnueabihf-gdb*.
- Click *OK*.

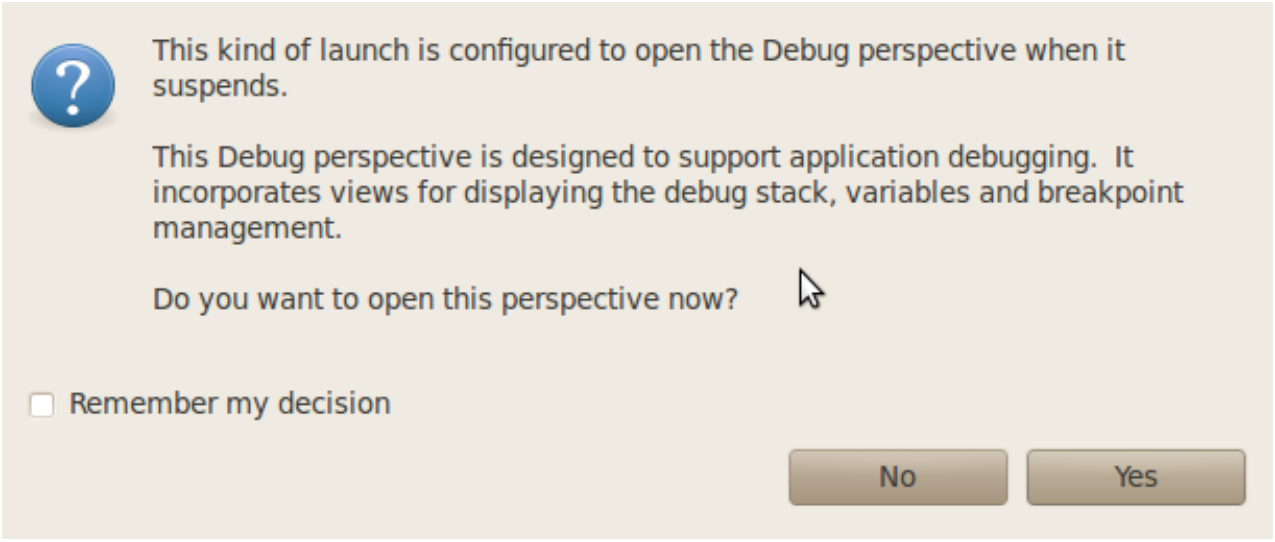


- Keep the *GDB command file* field empty.
- Select the *Connection* tab and select *TCP* in the drop-down box.
- Enter **192.168.3.11** (the target's IP address) in the *Host name* input field. The host's GDB will connect to this IP address to communicate with the target's GDB server.



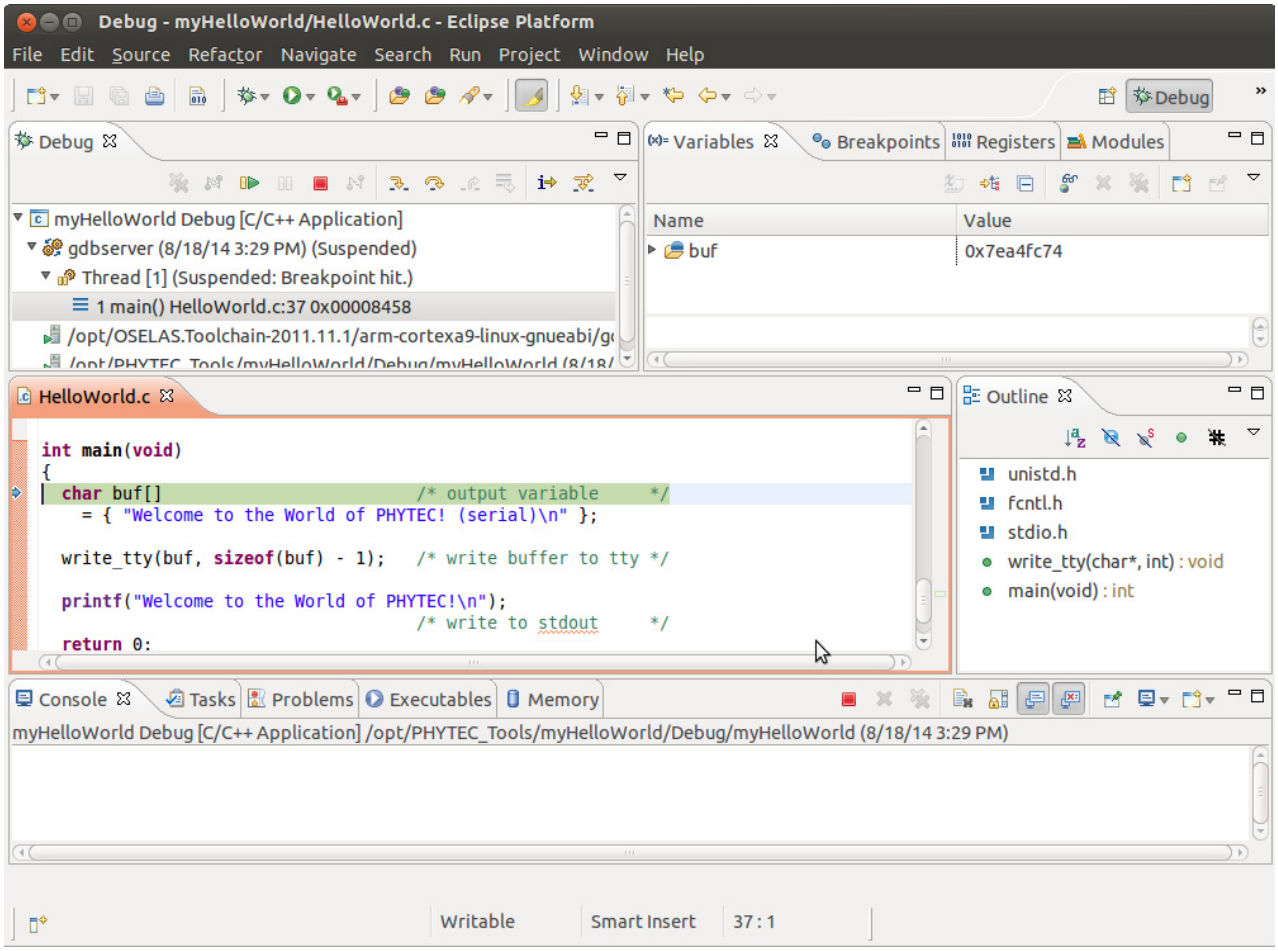
- Click *Apply*.
- Click *Debug*.

A new dialog appears.



- Select Yes to switch to the Debug perspective.

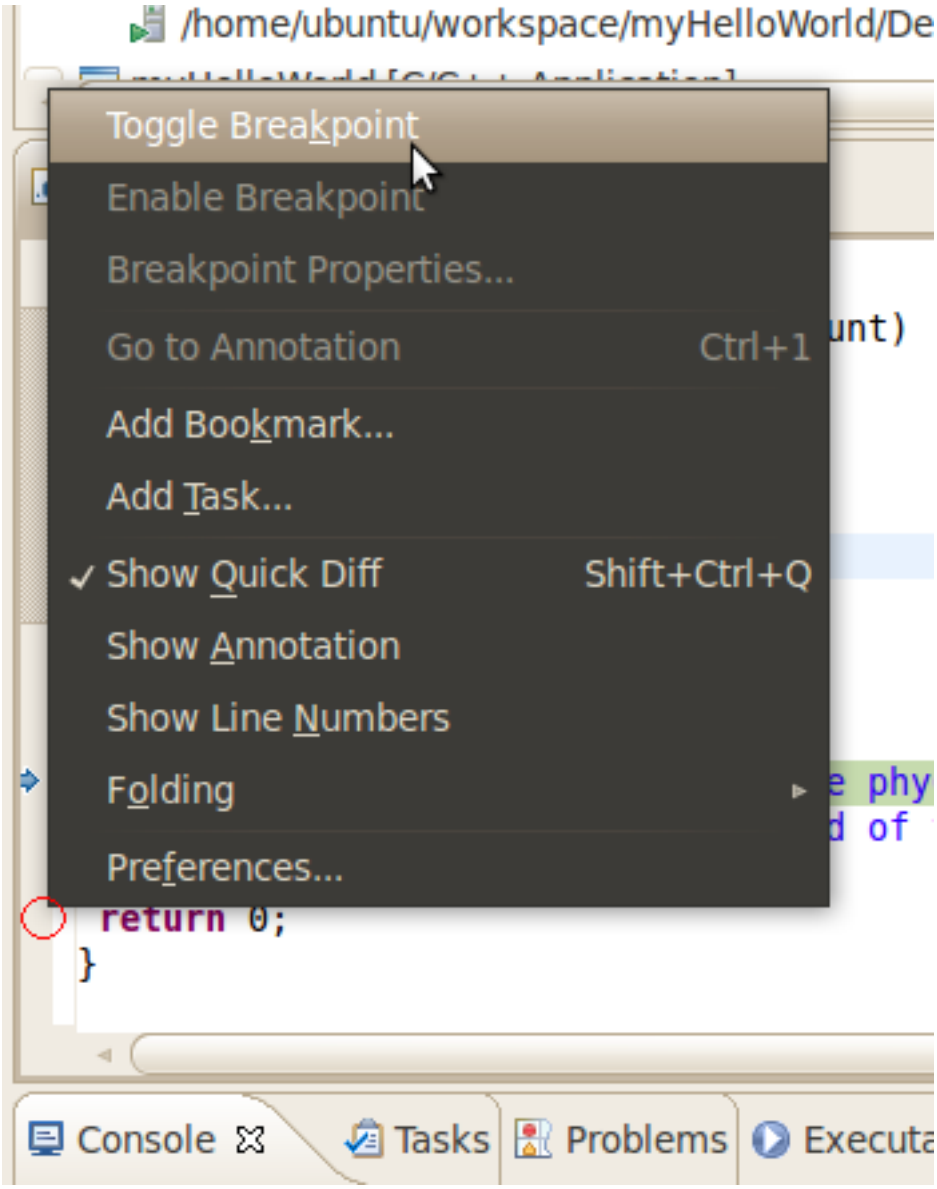
The debug perspective opens and the debugger stops automatically at the first line. The host's GDB is now connected to the GDB server on the target.



You have configured your project for remote debugging. You have started the GNU debugger in Eclipse and connected the host's GDB with the target's GDB server. You can now start to debug the project.

5.3 Setting a Breakpoint

Now you will set a breakpoint in your program. The breakpoint will be set on the last line of the function *main()*. If you resume the application, the debugger will stop on this line.

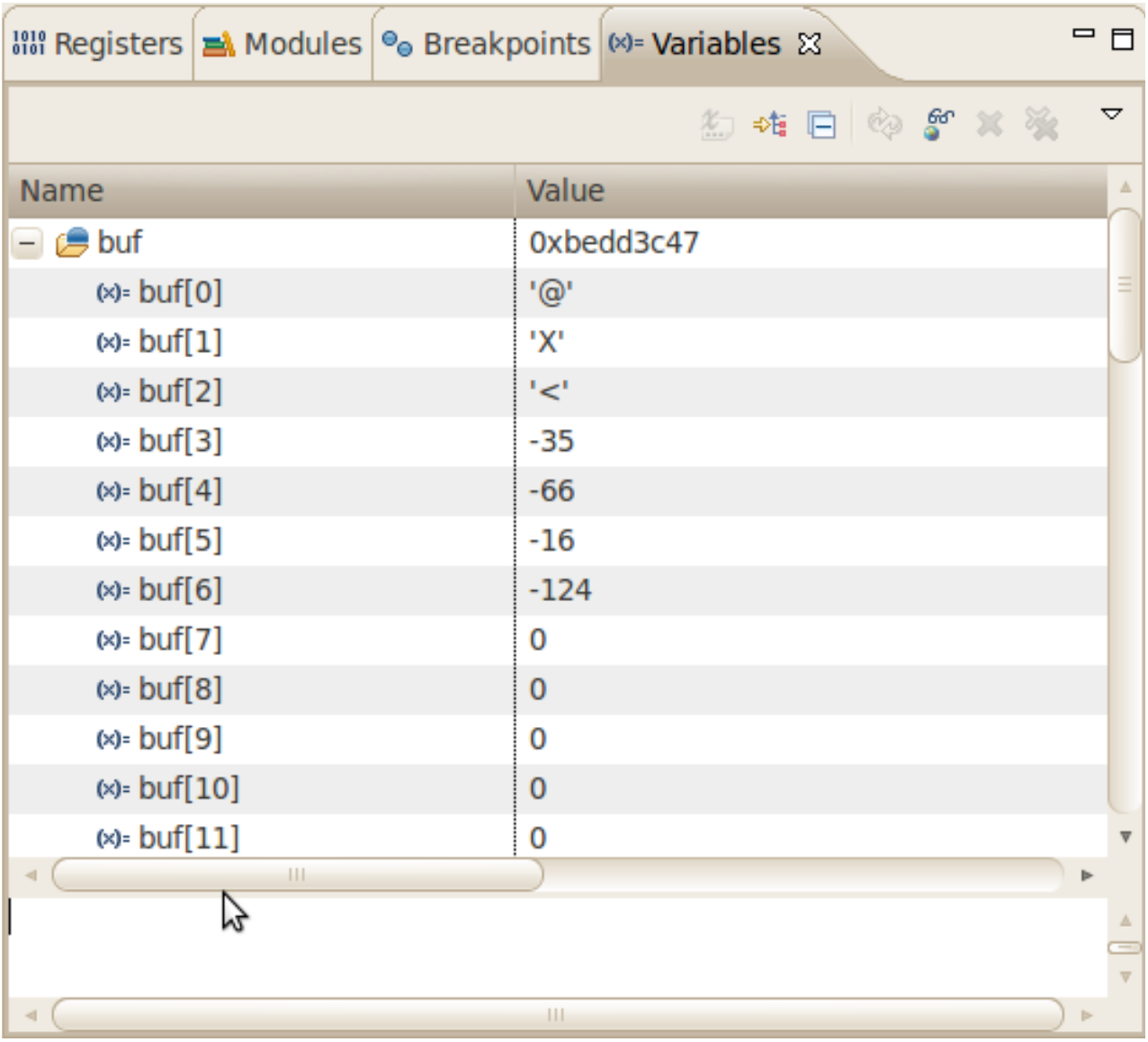


- Select the last line in *main()*.
- Right-click into the small grey border on the left-hand side and select *Toggle Breakpoint* to set a new breakpoint.

5.4 Stepping and Watching Variable Contents

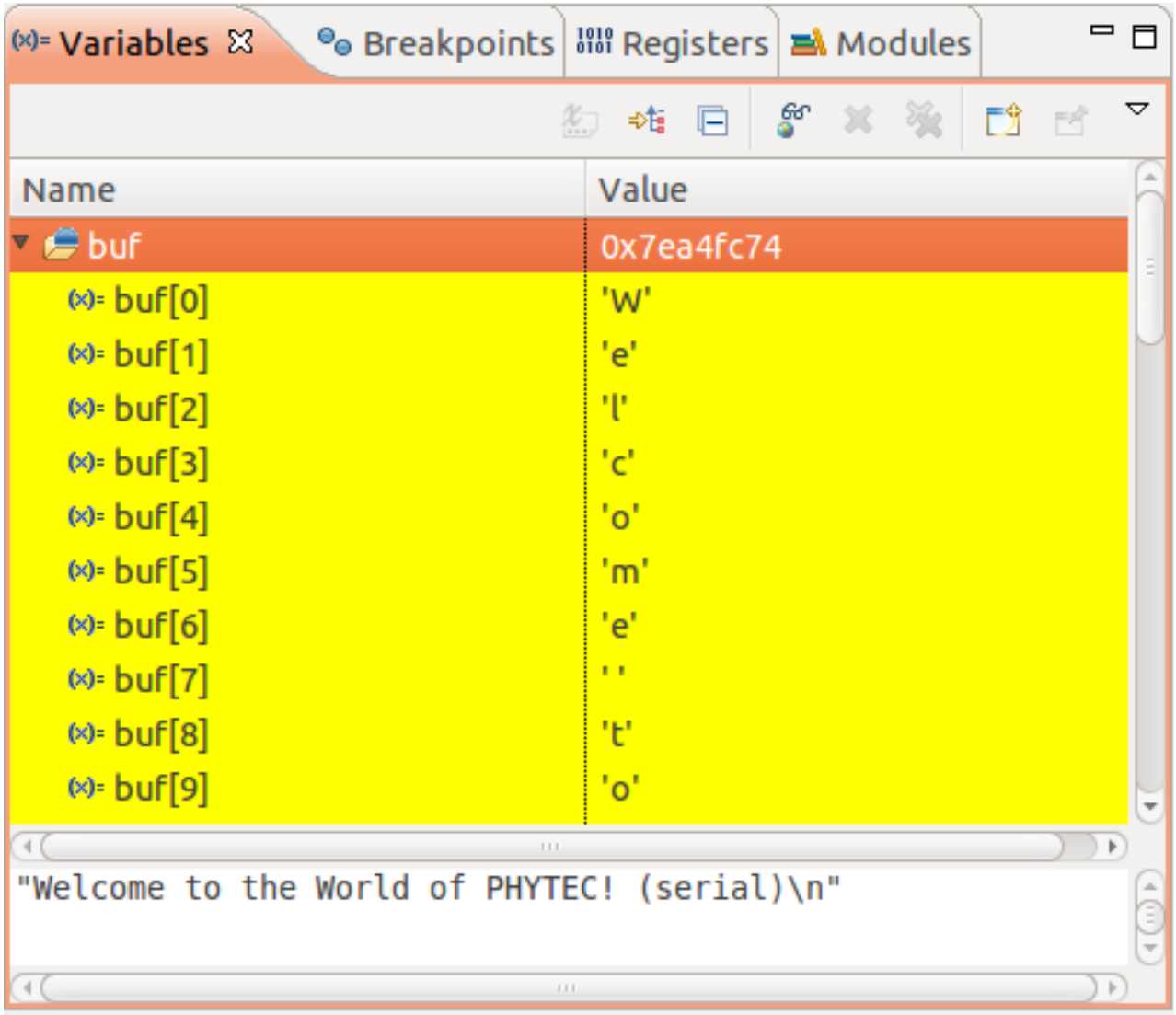
In this part you will step through the example project with the debugger. You will also learn how to check the content of a variable.

- Expand *buf* in the *Variables* window.



- Click the *Step Over* button in the *Debug* window to step to the next line.

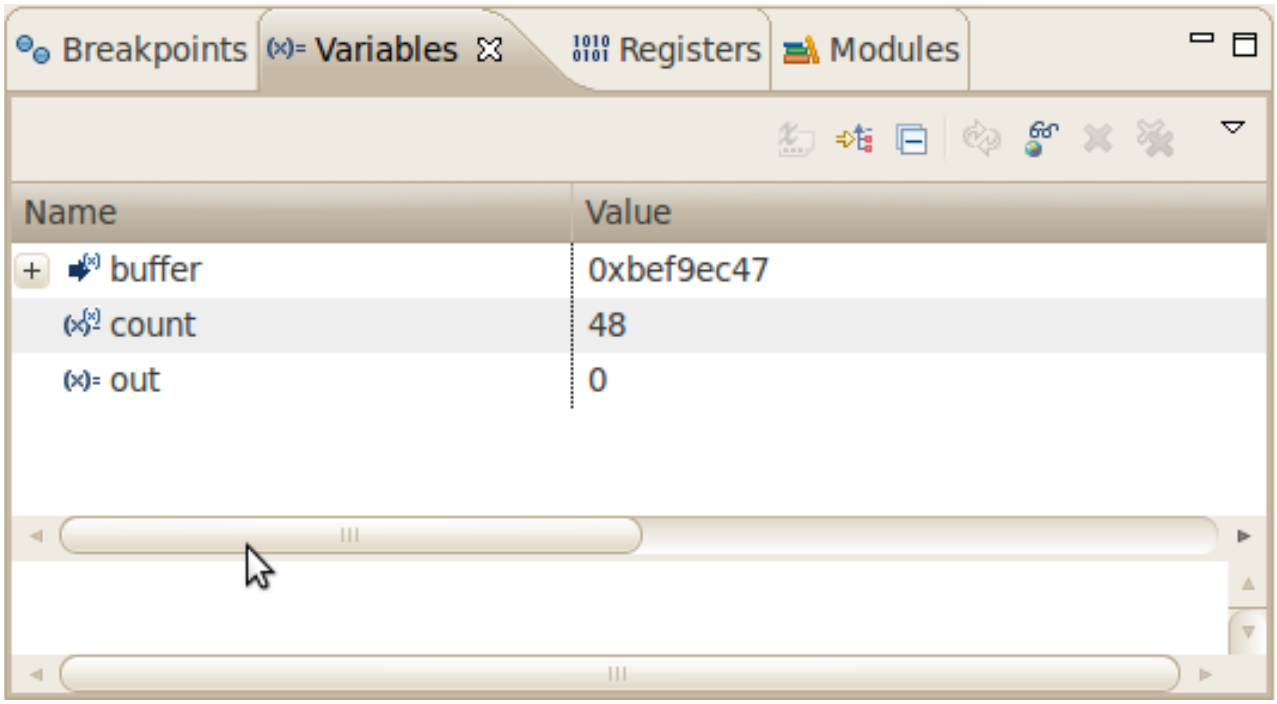
You will see the content of the *buf* variable in the *Variables* window.



- Click on the variable *buf*.
- Then click the button *Step into* to enter the function *write_tty()*.

The debugger stops in *write_tty()*.

You will see the following variable window:



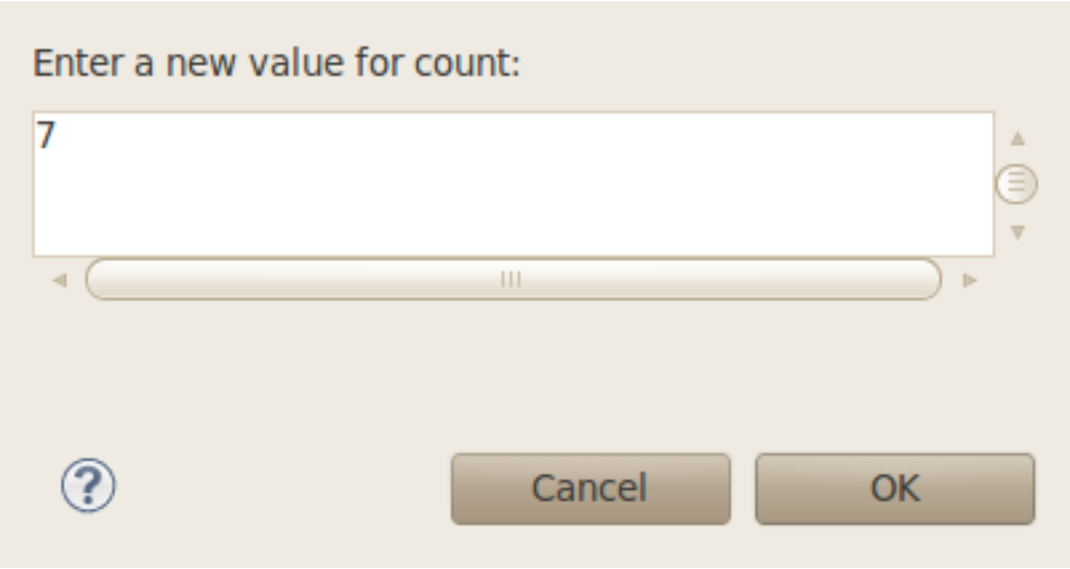
- Click on the variable *buffer*.

You will probably see a different address on the buffer pointer. Remember what address is shown in your case; you will need this address later.

5.5 Stepping and Watching Variable Contents

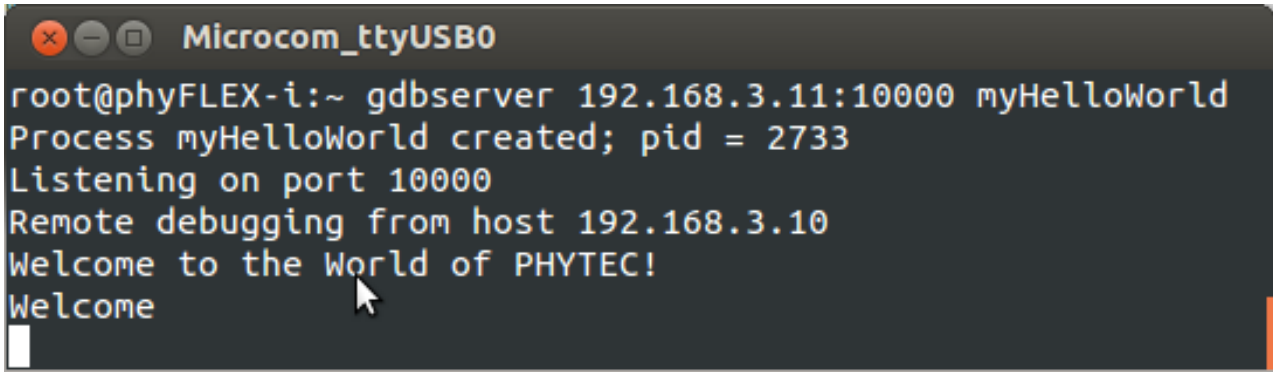
In this section you will change the value of a variable. At the end of this part you will see the effect of this change.

- Select the *count* variable in the *Variables* window.
- Right-click on *count* and select *Change Value*.



- Change the value of count to **7** and click *OK*.
- Open *Microcom* if the application is not already opened.
- Go back to *Eclipse*.
- Click the *Step Over*button **two times**.

- Change to *Microcom*.

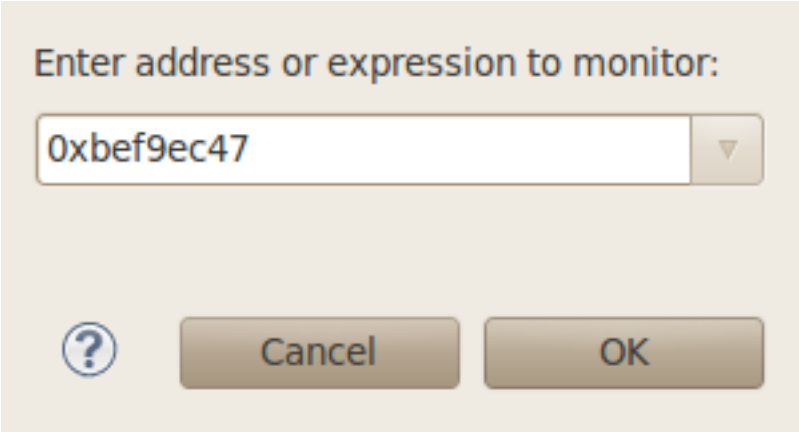


You will see the output *Welcome* in the Microcom window. This shows when changing the *counter* variable's value to 7 only the first seven characters of the buffer are output, instead of the whole sentence.

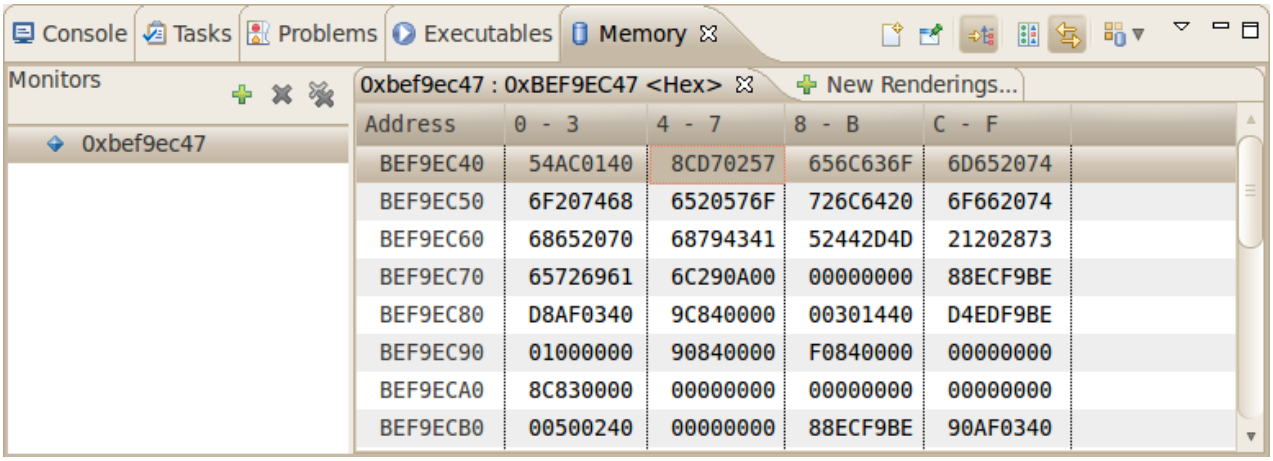
5.6 Using the Memory Monitor

In the last section of this chapter you will use the memory monitor to control the content at a memory address.

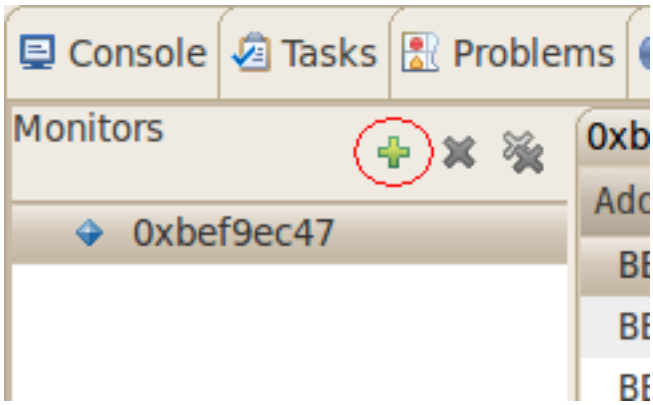
- Select the *Memory* tab.
- Click *Add Memory Monitor*.



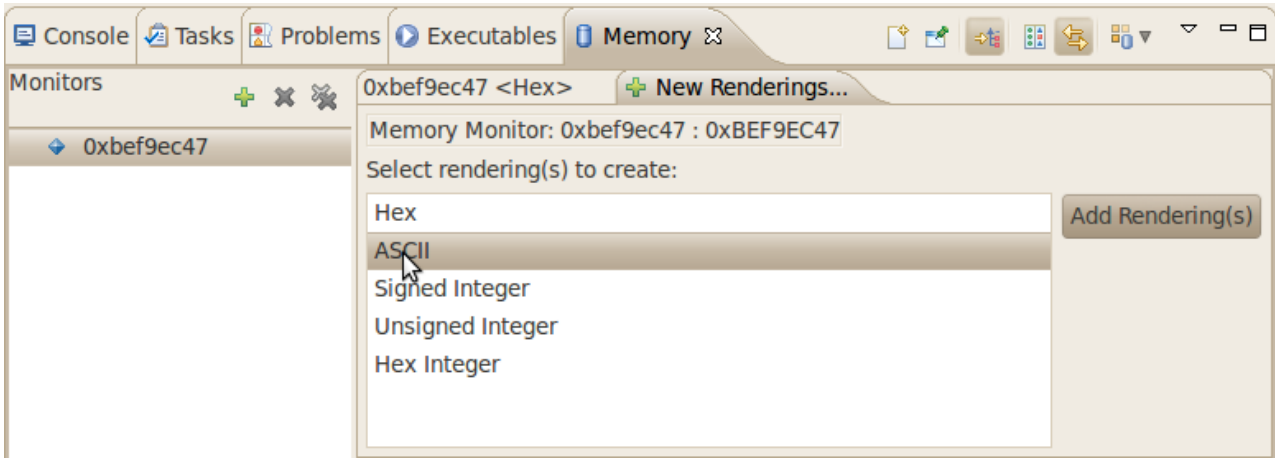
- Enter the address of buffer and click OK. Remember that the variable's address might differ from your system.



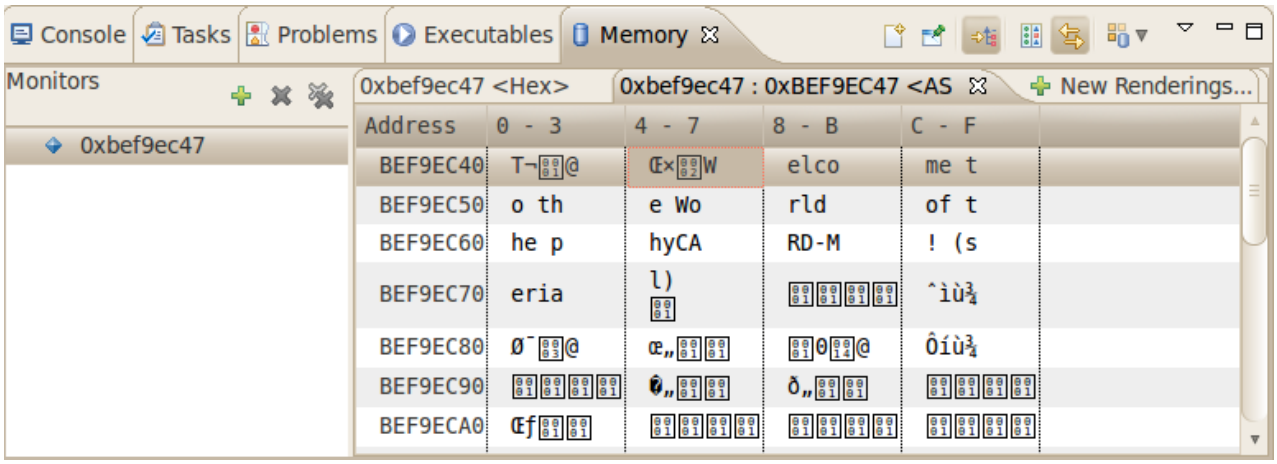
- Change the window size.



- Click *Add Rendering*.

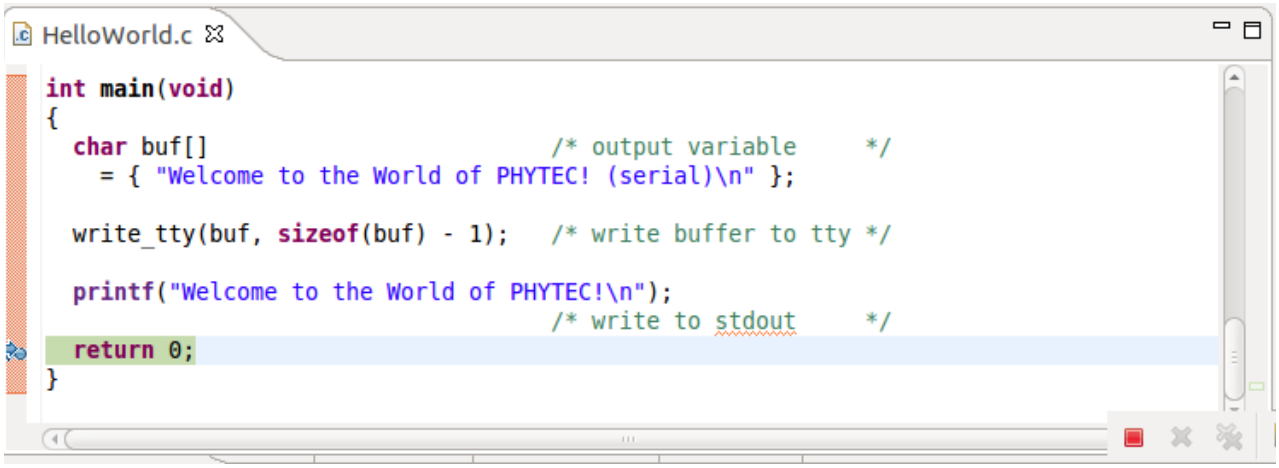


- Select *ASCII* and click *OK*.



You can see the contents of the variable *buffer* at the address *0xbee13ca7* (or whatever address is used on your system).

- Now click the *Resume* button from the menu bar.



The debugger stops at the breakpoint in the last line of *main()*.

- Click the *Resume* button to end the application.

You have successfully passed the debugging chapter. You are now able to configure and use Eclipse for remote debugging. You can step through a project, watch and change the content of variables, and you can use the memory monitor to view the content at a memory address.

6 Summary

This Quick Start manual gave you 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 phyFLEX-AM335x in conjunction with the Eclipse IDE and GNU C/C++ software tools.

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 learned how to copy and run a program on the target.

In the *Getting More Involved* section you got step-by-step instructions on how to configure and build a new kernel, modify the example application, create and build new projects, and copy programs to your phyFLEX-AM335x using Eclipse.

The *Debugging* part of this Quick Start gave you information on setting up and using the GNU debugger with the Eclipse IDE. You learned how to set breakpoints, watching and changing variable contents and using the memory monitor.

7 Installing Linux on the phyFLEX-AM335x

This part provides instructions on how to update bootloader (Barebox) on the phyFLEX-AM335x and how to write a kernel and/or a root file system image into the target's flash memory.

7.1 Configure Barebox Environments Variables

The following steps will be done on a Linux platform. We assume that you use our customized Ubuntu LiveDVD and that you have configured your host platform. Information on how to configure the host platform can be found in the *Getting Started* part of this Quick Start.

- Connect the serial cable with the UART0 RS232 on the target and the first serial interface on your host.
- Connect the cross-over Ethernet cable with the Ethernet connector X10 on the target and the correct network card of your host.

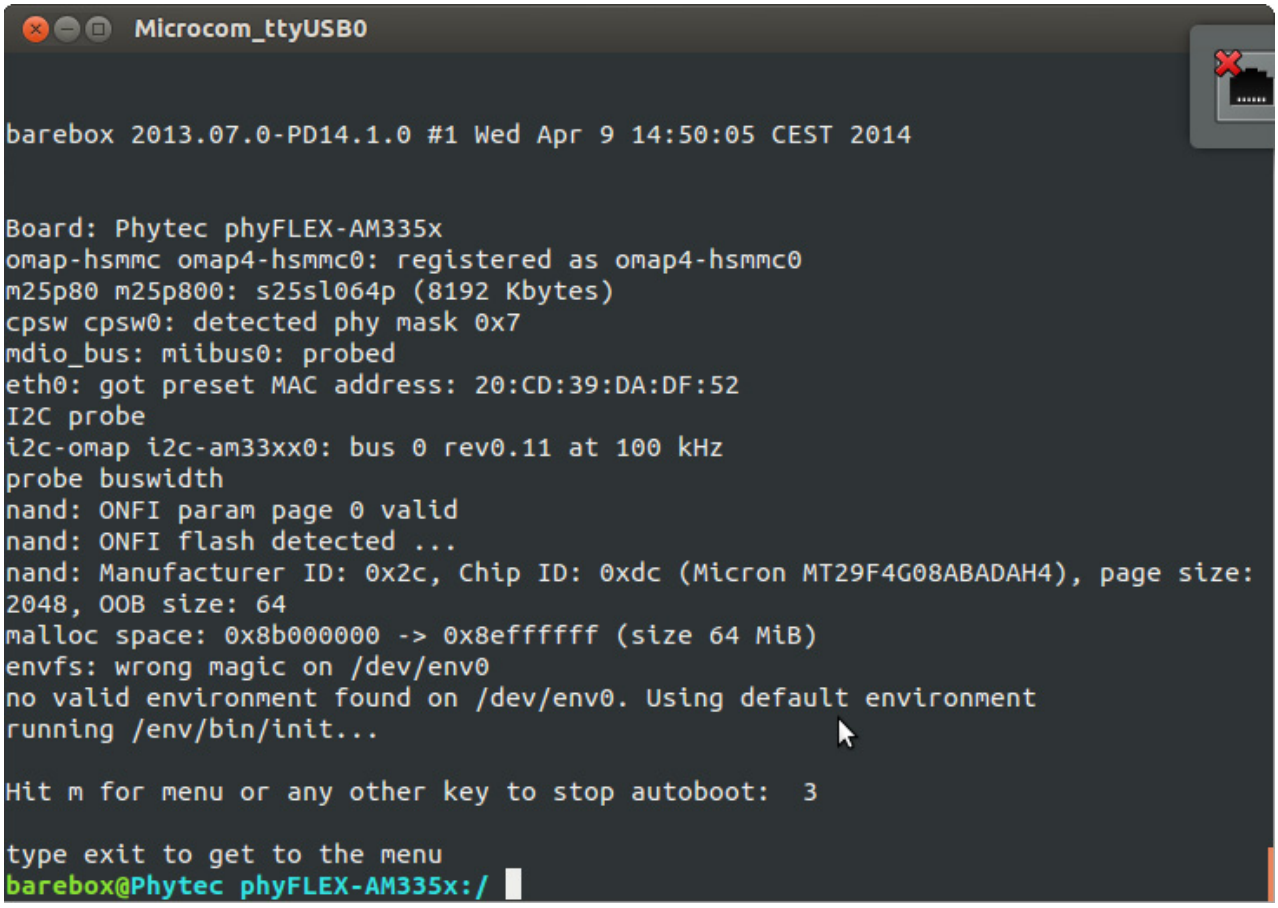
- Click the *Microcom* icon on your desktop.

Microcom is configured with the following configuration:

115200 baud, 1 start bit, 8 data bits, 1 stop bit, no parity, no flow control.

If you want to use another program than Microcom for serial communication, you will have to setup that program with these settings.

- Connect the AC adapter with the power supply connector PWR (12V) on your board.
- Press any key to stop autoboot.



- Check the network settings with following command:
  ifup eth0
  devinfo eth0
  The target should present this lines:
  ipaddr=192.168.3.11
  netmask=255.255.255.0
  gateway=255.255.255.0
  serverip=192.168.3.10
  If you need to change something, type:
  edit /env/network/eth0
  Edit the settings, save them by leaving the editor with Strg-D, then type saveenv and reboot the board.

7.2 Update the Bootloader

The bootloader used on the phyFLEX-AM335x is *Barebox* which is already preinstalled. If your target don't start because nothing is installed there is another way by updating the barebox over an SD card. For this case or if something goes wrong while you update your bootloader you can find more information on our website www.phytec.eu under "Support" / "FAQ/Download" / "phyFLEX-AM335x". If you are unsure please contact our support department otherwise you can do the following steps to update the bootloader.

In the directory /tftpboot in your live environment or under /PHYTEC/BSP on your DVD you can find a file starting with barebox-* this file is the Bootloader, also you can find a file called MLO this is the second stage bootloader.

Before executing this command, you should check that your Bootloader environment is properly configured. Look at "*Configure Barebox Environments Variables*" for more details.

- Open Microcom and press the RESET button on the target.
  You will see the message "*Hit any key to stop autoboot.*"
- Press any key to stop autoboot.
- Type **cp /mnt/tftp/barebox-image-pfla03 .** to get the barebox from your TFTP-server.
- After that store the Barebox into the NAND flash:
  erase /dev/nand0.barebox.bb
  cp barebox-image-pfla03 /dev/nand0.barebox.bb
- For the second stage bootloader the commands are:
  cp /mnt/tftp/MLO .
  erase /dev/nand0.xload.bb
  cp MLO /dev/nand0.xload.bb
- Press the RESET button on the board to restart your target.
  The target should now start with the new bootloader you have written into the flash.

We strongly recommend that after flashing the Barebox to another BSP version, you should erase the old environment: erase /dev/nand0.barebox-environment.bb

7.3 Writing the Kernel / Root File System into Flash

In the directory */tftpboot* in your live environment or under */PHYTEC/BSP* on your DVD you can find a file called *uImage-pfla03* - this file is the Linux kernel image. There is another file, *root-pfla03.ubifs* this file contains the Linux root filesystem.

Before executing this command, you should check that your Bootloader environment is properly configured. Look at "*Configure Barebox Environments Variables*" for more details.

- Open Microcom and press the RESET button on the target.
  You will see the message "*Hit any key to stop autoboot.*"
- Press any key to stop autoboot.
- Now we download the images from the TFTP server to the target's RAM, then we erase the required flash and write the images from the RAM into the flash.
- Type **erase /dev/nand0.kernel.bb** to erase the kernel partition.
- Type **cp /mnt/tftp/uImage-pfla03 /dev/nand0.kernel.bb** to download the kernel using TFTP and write it into the target's flash. The copy process can take up to several minutes.
- Now we flash the root filesystem type:
  ubiformat /dev/nand0.root
  ubiattach /dev/nand0.root
  ubimkvol /dev/ubi0 root 0
  cp /mnt/tftp/root-pfla03.ubifs /dev/ubi0.root
- Type **boot** to boot the phyFLEX-AM335x with the new kernel and root file system.

8 Setup your own Linux-Host-PC

In this chapter we give an overview of the modifications which we made to the Ubuntu version on the Linux-phyFLEX-AM335x-Kit-DVD in comparison to the original Ubuntu. In the following we distinguish between optional and essential modifications. So you can see faster which changes are important to execute this Quickstart in case you don't want to use our modified Ubuntu version. You can find a step-by-step instruction of the essential changes in order to modify your own distribution.

We can't guarantee that the presented changes are compatible to other distributions or versions. If you want to use another distribution, it might take a lot of individual initiative. We do not support other distributions. You should be sure about what you do.

8.1 Essential settings

In the following you see a short instruction of the important settings which are essential to guarantee the execution of this Quickstart.

8.1.1 Installation of software packages

We begin with the installation of the required software packages with using the package manager *APT*.

- It is useful to split the commands to keep the overview.
  Packages which are needed for compiling and building the Board Support Package:
  sudo apt-get -y install libncurses-dev g++ gawk flex bison texinfo quilt autoconf gettext lzop
  Packages for developoment:
  sudo apt-get -y install vim eclipse
  For setting up the TFTP server:
  sudo apt-get -y install tftpd-hpa
  During installation it can happen that some programs ask for a license agreement. Follow the shown steps.

The first preparations are finished and you will find the instructions to setup the bigger software packages in the next chapters.

8.1.2 Setup the serial connection

To enable the serial connection with the target it's important to add the existing user to the existing group dialout.

You can change this with one simple command:

sudo usermod -aG dialout $USER

After a restart it is possible to use the serial connection with a program like *Microcom*.

8.1.3 Setup of toolchain, PTXdist and BSP

The important packages are installed now and we begin with the setup of *PTXdist* which we need to modify the *Board Support Package* by your own.

- First we create a local directory in our */home/* folder and change into this directory:
  mkdir /home/$USER/local
  cd /home/$USER/local
- In the second step we unpack the compressed *PTXdist´*- which you will find on our Linux-phyFLEX-AM335x-Kit-DVD under */PHYTEC/BSP* - in the folder *local*:
  tar -xjf ...PHYTEC/BSP/ptxdist-XXX.tar.bz2
- After this step a *PTXdist* folder is created in which we change by typing:
  cd ptxdist*
- Afterwards we can configure, compile and install *PTXdist* via the standardized *GNU*-Tools. For this we use the following commands:
  ./configure
  make
  sudo make install
- The installation is finished and the temporary folder *local* can be removed:
  cd ../../
  rm -fr local

PTXdist is now ready for use and can be accessed through the **ptxdist** command. But before we can start cross-compiling, we need a toolchain which provides tools to build the *Board Support Package*.

On our Linux-phyFLEX-AM335x-Kit-DVD you will find under */PHYTEC/BSP* an already prebuilt Toolchain for the phyFLEX-AM335x which we will use.

- Therefore we first decompress the toolchain using the following command:
  tar -xvPpjf ...PHYTEC/BSP/arm-cortexa8-linux-gnueabihf.tar.bz2

By this operation the toolchain is directly archived under */opt/OSELAS**.

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If any error occurs or if you want to build your own toolchain you will find detailed information in our "BSP-Quickstart phyFLEX-AM335x" under ftp://ftp.phytec.de/.

Finally our attention is focused on the setup of the *Board Support Package*.

In our modified Ubuntu version our BSPs are located under */opt/PHYTEC_BSPs/*. So let's use the following procedure:

- **sudo mkdir /opt/PHYTEC_BSPs**
- Now only root has the privilege to access this folder. Therefore we must change the permissions:
  sudo chmod 777 /opt/PHYTEC_BSPs
- After this we switch over to the folder and use our compressed but not yet built PHYTEC-BSP on the DVD under */PHYTEC/BSP/*.
  cd /opt/PHYTEC_BSPs
  tar -xzf ...PHYTEC/BSP/phyFLEX-AM335x*.tar.gz
- The BSP is unpacked and we change into the created folder:
  cd phyFLEX-AM335x*
- The time has come to handle with *PTXdist*. First of all we must specify our platform with which we will work:
  ptxdist platformconfig configs/phyFLEX-AM335x
- The required toolchain should be found automatically and we can use *PTXdist* to build the BSP:
  ptxdist go
  Depending on your system hardware this procedure can take up to several hours.
- Finally we must create the images which we can flash to the target.
  ptxdist images

Congratulations - you have successfully completed the most time-consuming pre-requirements. In the next chapter you will be informed about everything concerning the set up of Eclipse.

8.1.4 Setting up Eclipse and integrate plug ins

In this chapter we setup *Eclipse* and integrate the plug ins for *QT* and *C/C++*. Thereby you can assign own programs, written in *Eclipse,* to the target.

- First we must create a *workspace* folder, in which we can save the *Eclipse* projects. In our example we make this in our */home/* folder:
  mkdir /home/$USER/workspace
- Thereafter we can open *Eclipse* and insert the path to our created workspace in the pop-up window:
  eclipse
- Eclipse is started and now we click at *Help* in the menu bar ► *Install new Software*.
- Thereupon a window was opened and in the text field "*Work with*" we enter the following address: **http://download.eclipse.org/tools/cdt/releases/indigo** and click on **"Add"**.
- After a while the software which we can integrate appears in the area with a scrollbar. We check **"CDT Main Features"** and click at **"Next"**.
- Now the system shows us an overview of the installation details, which we skip with a click on **Next**.
- At last the system shows us the licensing agreement, which we accept and after we have clicked on **Finish** it begins to install the required software.

The *CDT* plug in is installed. We close *Eclipse* and go on with the *QT* integration.

- For the *QT* integration we must use an external package from the *Nokia* website. This package is already available on our DVD under */PHYTEC/Applications*. We unpack the compressed archive in the */usr/lib* folder:
  cd /usr/lib
  tar xzf ...PHYTEC/Applications/qt-eclipse-integration-linux.x86-1.6.1.tar.gz
- After that we start *Eclipse* with the option *clean*, which cleans any cached data:
  eclipse --clean
- *Eclipse* is started and now we must setup one small thing:
  In the menu bar we click on **"Window" ► "Preferences" ► "QT"** and enter the following QT specific information **Name:** *QT* ► **Bin Path:** */opt/PHYTEC_BSPs/phyFLEX-AM335x-PD14.1.0/platform-phyFLEX-AM335x/sysroot-cross/bin* ► **Include Path:** */opt/PHYTEC_BSPs/phyFLEX-AM335x-PD14.1.0/platform-phyFLEX-AM335x/sysroot-target/usr/include*)

- Close Eclipse.
- Because we use *ptxdist-2013.01.0* we need an additionally step.
  Add following lines to */etc/profile*:
  export PTXDIST_CROSS_CPPFLAGS='-isystem /opt/PHYTEC_BSPs/phyFLEX-AM335x-PD14.1.0/platform-phyFLEX-AM335x/sysroot-target/include-isystem/opt PHYTEC_BSPs/phyFLEX-AM335x-PD14.1.0/platform-phyFLEX-AM335x/sysroot- target/usr/include'
  export PTXDIST_CROSS_LDFLAGS='-L/opt/PHYTEC_BSPs/phyFLEX-AM335x-PD14.1.0/platform-phyFLEX-AM335x/sysroot-target/lib-L/opt/PHYTEC_BSPs/ phyFLEX-AM335x-PD14.1.0/platform-phyFLEX-AM335x/sysroot-target/usr/libWl,-rpath-link-Wl,/opt/PHYTEC_BSPs/phyFLEX-AM335x-PD14.1.0/platform-phyFLEX-AM335x/sysroot-target/lib-Wl,-rpath-link-Wl,/opt/PHYTEC_BSPs/phyFLEX-AM335x-PD14.1.0/platform-phyFLEX-AM335x/sysroot-target/usr/lib'
  export PTXDIST_PLATFORMCONFIG=/opt/PHYTEC_BSPs/phyFLEX-AM335x-PD14.1.0/selected_platformconfig
  export PATH=/opt/PHYTEC_BSPs/phyFLEX-AM335x-PD14.1.0/platform-phyFLEX-AM335x/sysroot-host/lib/wrapper/:$PATH
- Finally restart your computer to activate the changes in /etc/profile.

Congratulations! You have successfully integrated two new plugins in Eclipse and now you can start programming in C/C++ and QT in an Eclipse environment. In the next sub-section you will find a short introduction on how to setup a TFTP server.

8.1.5 Setting up a TFTP server

In the chapter *"Installation of software packages"* we have installed the required packages to set up a TFTP server. Now we must change some short settings.

- First we change the file */etc/default/tftp-hpa* as follows:
  ```
  TFTP_USERNAME="tftp"
  TFTP_DIRECTORY="/tftpboot"
  TFTP_ADDRESS="0.0.0.0:69"
  TFTP_OPTIONS="--secure"
  ```
- Then we must create a folder called */tftpboot*. The TFTP server accesses this folder later.
  mkdir /tftpboot
- At last we must set the right permissions:
  chmod 777 /tftpboot
- Actually there is a bug in in the tftp-hpa daemon. The daemon don't start after the system is rebootet. You can start it in the terminal with following command:
  restart tftpd-hpa
  Another permamently way is to create a file called *tftpd-hpa* under */etc/network/if-up.d/* and insert following:
  #!/bin/sh
  restart tftpd-hpa
  Save the file and set the correct permissions with **chmod 755 /etc/network/if-up.d/tftpd-hpa** .

You have successfully set up the TFTP server. In the future the phyFLEX-AM335x can access to the /tftpboot/ folder to load the images.

8.2 Optional settings

In the following we show the optional settings. These settings are not needed for a successful operation of this Quickstart. They only simplify the handling and the look of the system. For this reason we show the modifications without big explanation.

- Installation of *vim*, the improved *vi* editor.
- Creation of desktop-icons for faster and easier start of required programs.
- The following modifications were made to the look of Ubuntu:
  - Other wallpaper and associated options were adjusted with the help of **gsettings**.
  - Changing the color of the *Gnome* terminal.
- **History-search-backward** and **history-search-forward** in */etc/inputrc* is activated. This allows you to search through your history with the entered string.
- Also there are some scripts that will be executed at the first start after the installation. These scripts ensure that the right permissions are set for the created user.

9 Installation of the modified Ubuntu

In this chapter you will find an instruction on how to install the modified Ubuntu on the Linux-phyFLEX-AM335x-Kit-DVD.

If another operating system is installed on your computer, you should first make a backup of your important files. Before we can start, make sure that your computer is set to boot from DVD before it boots from a hard disk drive.

- Insert the Linux-phyFLEX-AM335x-Kit-DVD into your DVD drive.
- Start or restart your computer. Your system finds a bootable DVD and starts from it. After a while a language screen appears.
- Select your desired language and click **Install Ubuntu**.
- The **Preparing to install Ubuntu** window appears. From Ubuntu it's adviced that you select "*Download updates while installing*" and "I*nstall this third-party software*" now. Click on **Continue**.
- The **Installation type** window appears. You now have different options how to install Ubuntu. The three possibilities are explained in the dialog. After you have choose one click on **Continue**.
- The **Install Ubuntu...** window appears. After you have checked the settings you can click on **Install now**.
- While the installation is started Ubuntu asks for your location, keyboard layout and login and password details.
- When the installation wizard has finished, the "Installation complete" window appears. Click **Restart now** to restart your computer. Ubuntu is now installed.

10 Revision History

Date	Version numbers	Changes in this manual
2014-08-20	Quickstart L-797e_1	First draft Working with PD14.1.0 and Ubuntu 12.04.5