



# **Running the Ethernet MAC / EasyWEB example from the LPC1700 Code Bundle from NXP (for Keil MDK-ARM)**

Product Line Microcontrollers  
Business Line Standard ICs

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- ▶ [Example description](#)
- ▶ [Running the EMAC / EasyWEB example from the LPC1700 Code Bundle using the ULINK2 or ULINK-ME JTAG debugger](#)
- ▶ [Running the EMAC / EasyWEB example from the LPC1700 Code Bundle using the FlashMagic ISP software](#)

# Prerequisites for running this example

- ▶ There are several hardware and software tools necessary in order to run this example:
  - MCB1760 or MCB1750 Evaluation Board from Keil
  - LPC1700 Code Bundle software package
  - PC with 2 USB ports, LAN port, and 125MB of available hard disk space
  - Keil MDK-ARM IDE (free eval version is ok)
  - FlashMagic In-System Programming software and PC serial port – OR – ULINK2 / ULINK–ME JTAG debugger
  - Crossover Ethernet LAN cable / serial cable (only if FlashMagic is used)
- ▶ Please refer to the LPC1700 Sample Code Bundle Introduction / Setup file (code.bundle.lpc17xx.keil.intro.setup.pdf) for more details on setting up the hardware and software environment
  - This file can be found here:  
<http://www.standardics.nxp.com/support/software/code.bundle.lpc17xx.keil/>

# Example Description

- ▶ The EMAC project is a simple embedded web server for the NXP LPC17xx microcontrollers also known as “EasyWEB”
- ▶ This tiny web server was taken from the 'Design & Elektronik' magazine extra issue 'Embedded Internet'.
  - This software was adapted to work with a Keil MCB1700 board and the ARM RealView C-Compiler with as few modifications as possible
- ▶ The served web page shows the value of one analog input (AN2) which can be controlled via the blue potentiometer on the MCB1700 board

# Example Description (cont.)

- ▶ EasyWEB needs very little resources and therefore has some restrictions:
  - only one active TCP session at any one time
  - no support for fragmented IP datagrams
  - no buffer for TCP datagrams received in wrong order
  - only one web page. No GIF/JPG graphics possible.
- ▶ The IP address can be modified in the module tcpip.h to fit into your existing LAN (see MYIP\_x)
- ▶ At the end of this exercise you will be able to load, compile, execute and verify the operation of the EasyWeb example

**Running the EMAC / EasyWEB  
example from the LPC1700 Sample  
Code Bundle using the ULINK2 or  
ULINK-ME JTAG debugger**

# EasyWEB example using JTAG debugger

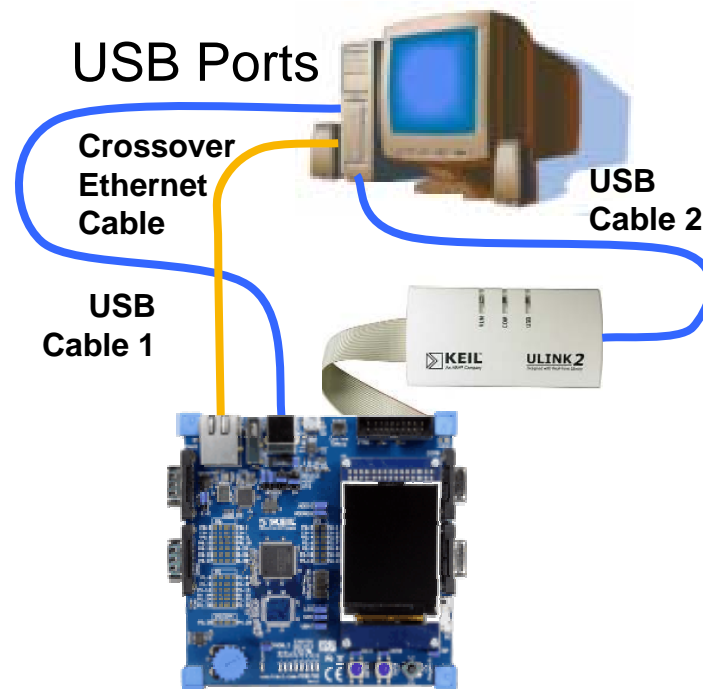
## Step 1: Hardware setup

- ▶ Connect your Keil ULINK2 to your PC using the USB cable and to the MCB1700 via the JTAG connector
- ▶ Connect the MCB1700 to your PC via the crossover Ethernet cable

**Note:** Remove the RST and ISP jumpers on the MCB1700 board:



**Note:** instead of ULINK2 you can also use ULINK-ME:



**Note:** Move the E/C and the E/U jumpers on the MCB1700 board to the upper (E) position:



# EasyWEB example using JTAG debugger

## Step 2: Opening up the Keil uVision3 project

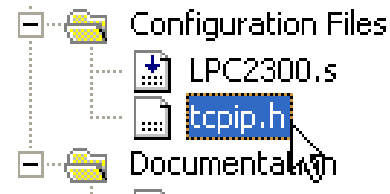
- ▶ Open the project by double-clicking on file “easyweb.uv2” here:  
`..\LPC17xxSampleSoftware.xxx\Keil\EMAC\easyWeb.uv2`
  - Note: Ignore the ‘invalid path’ warning if you see one (just click ‘OK’)
- ▶ Familiarize yourself with the following files:
  - tcpip.c: implements the TCP/IP-stack and provides a simple API to the user
  - EMAC.c: Ethernet packet driver
  - easyweb.c: implements a dynamic HTTP-server by using the easyWEB-API
  - system\_LPC17xx.c: Cortex-M3 Device Peripheral Access Layer Source File (CMSIS-compliant)
  - startup\_LPC17xx.s: CMSIS Cortex-M3 Core Device Startup File (CMSIS-compliant)
  - Abstract.txt: Describes what the EasyWEB example does



# EasyWEB example using JTAG debugger

## Step 3: Verifying the PC IP address

- ▶ Open file tcpip.h by double-clicking it  
This file holds the IP Address



- ▶ Check the IP address of the EasyWeb code:

```
017 // easyWEB-stack definitions
018 #define MYIP_1
019 #define MYIP_2
020 #define MYIP_3
021 #define MYIP_4
```

192  
168  
0  
110

# EasyWEB example using JTAG debugger

## Step 4: Changing the PC IP address

- ▶ Change the IP address on your PC so it's in the same sub domain as your board:


- Open up a command window
- Type ipconfig (this will show the current setting)



```
Command Prompt
Windows IP Configuration

Ethernet adapter Local Area Connection:

    Connection-specific DNS Suffix  . : usbsjobay1rd.sc.philips.com
    IP Address. . . . . : 134.27.39.105
    Subnet Mask . . . . . : 255.255.255.0
    Default Gateway . . . . . : 134.27.39.254
```

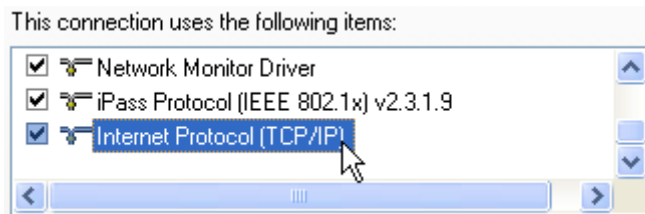
- To change the IP address of your PC Ethernet adapter, do this:
  - Open Windows Explorer 
  - Click “My Network Places”
  - Click “View Network Connections”
  - Right-click “Wireless Network Connection” and click “disable”
  - Double-Click “Local Area Connection”



# EasyWEB example using JTAG debugger

## Step 4: Changing the PC IP address (cont.)

- Click “Properties”
- Scroll to Internet Protocol (TCP/IP) and double-click it to open the Properties



- Click “use the following IP address” and enter an IP address that is in the same sub domain as the board, but different from it; e.g.:

☒ Use the following IP address:

IP address:

Subnet mask:

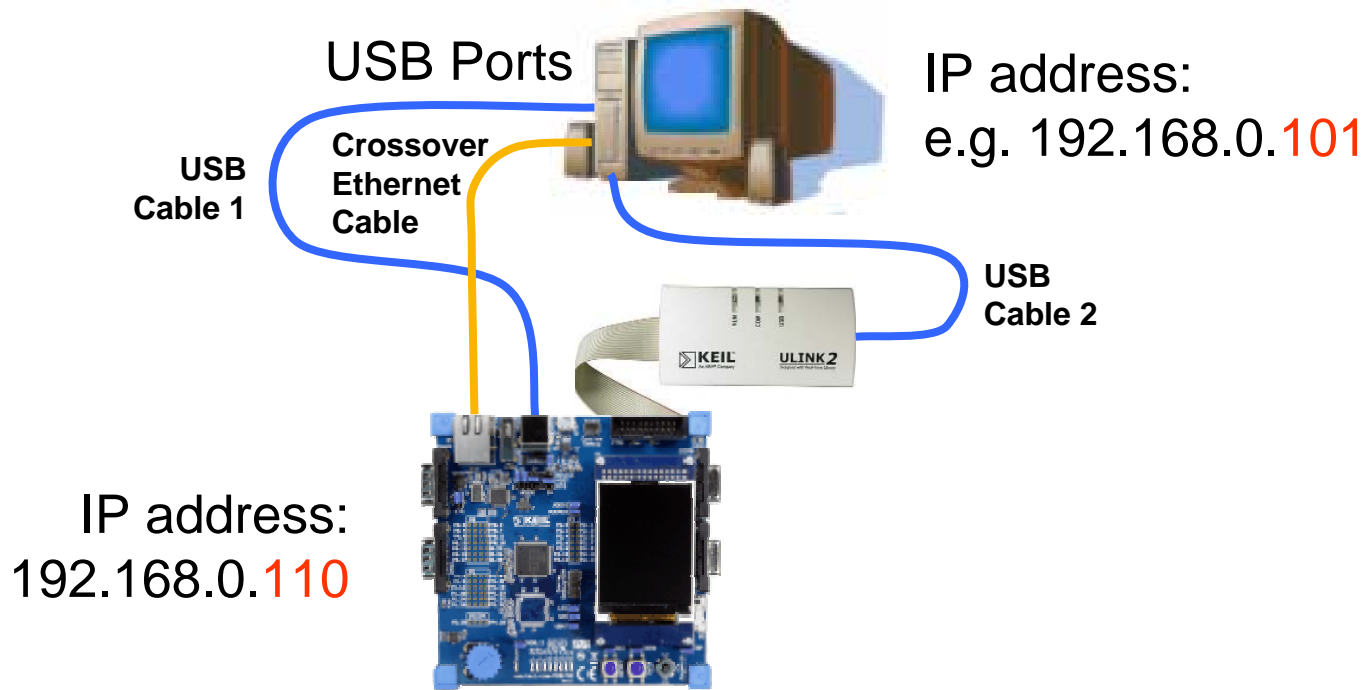
- Click OK, then click OK again.
- Type **ipconfig** again in the command window to verify the IP address of your PC has changed:

```
Ethernet adapter Local Area Connection:
Connection-specific DNS Suffix . : 
IP Address. . . . . : 192.168.0.101
Subnet Mask . . . . . : 255.255.255.0
Default Gateway . . . . . :
```

# EasyWEB example using JTAG debugger

## Step 5: Verifying the LAN setup

- ▶ Make sure laptop and board are connected as shown below with the Ethernet cable and the board is powered up
- ▶ Make sure PC and board have an individual IP addresses – but in the same IP subnet: 192.168.0.xxx For example:



# EasyWEB example using JTAG debugger

## Step 6: Compiling the example project

- ▶ Make sure the uVision3 Target setting is 'FLASH'



- ▶ Build the project clicking the “Rebuild all target files”-button



- ▶ Example should build with no errors, no warnings

```
Build target 'FLASH'
assembling startup_LPC17xx.s...
compiling system_LPC17xx.c...
compiling easyweb.c...
compiling EMAC.c...
compiling tcpip.c...
linking...
Program Size: Code=7660 RO-data=1796 RW-data=84 ZI-data=1508
FromELF: creating hex file...
".\FLASH\easyWeb.axf" - 0 Error(s), 0 Warning(s).
```

# EasyWEB example using JTAG debugger

## Step 7: Programming the code to on-chip Flash

- ▶ Select Flash as the target (if not already done)



- ▶ Make sure JTAG debugger is connected to PC and board

- ▶ Click on the LOAD button to start download



- ▶ Verify that the download is ok (in the Build window)

Erase Done.

Programming Done.

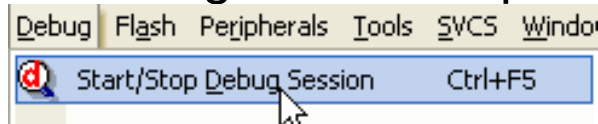
Verify OK.

- ▶ Please note that the code is not running yet...

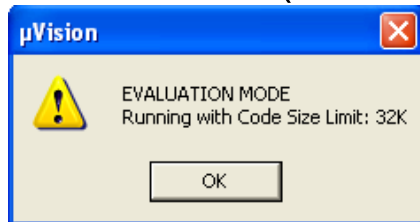
# EasyWEB example using JTAG debugger

## Step 8: Starting a Debugging session

- ▶ Click “Debug > Start/Stop Debug Session”



- ▶ Click OK here (Evaluation Version Message)



- ▶ Code will stop at main()

```
032 int main(void)
033 {
034     //InitOsc();
035     //InitPorts();
036     SystemInit();
037     TCPLowLevelInit();
```

- ▶ Hit 'Run' button

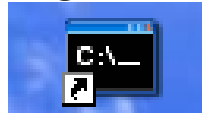


# EasyWEB example using JTAG debugger

## Step 9: Pinging your board from your PC

- ▶ Try to ping your board from your PC:

- Open up a command window



- Type `ping 192.168.0.110` to ping your target board.

```
C:\>ping 192.168.0.110

Pinging 192.168.0.110 with 32 bytes of data:

Reply from 192.168.0.100: bytes=32 time=5ms TTL=64
Reply from 192.168.0.100: bytes=32 time<1ms TTL=64
Reply from 192.168.0.100: bytes=32 time<1ms TTL=64
Reply from 192.168.0.100: bytes=32 time<1ms TTL=64

Ping statistics for 192.168.0.110:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 5ms, Average = 1ms
```

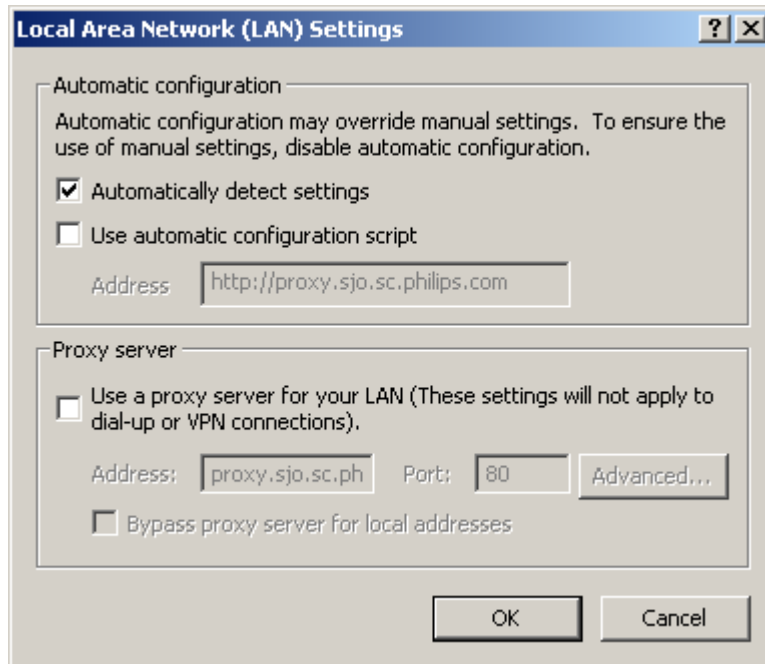
- ▶ Note the orange LED (on the Ethernet connector of the MCB1700 Board) flashes every time an Ethernet frame is received



# EasyWEB example using JTAG debugger

## Step 10: Accessing the web page

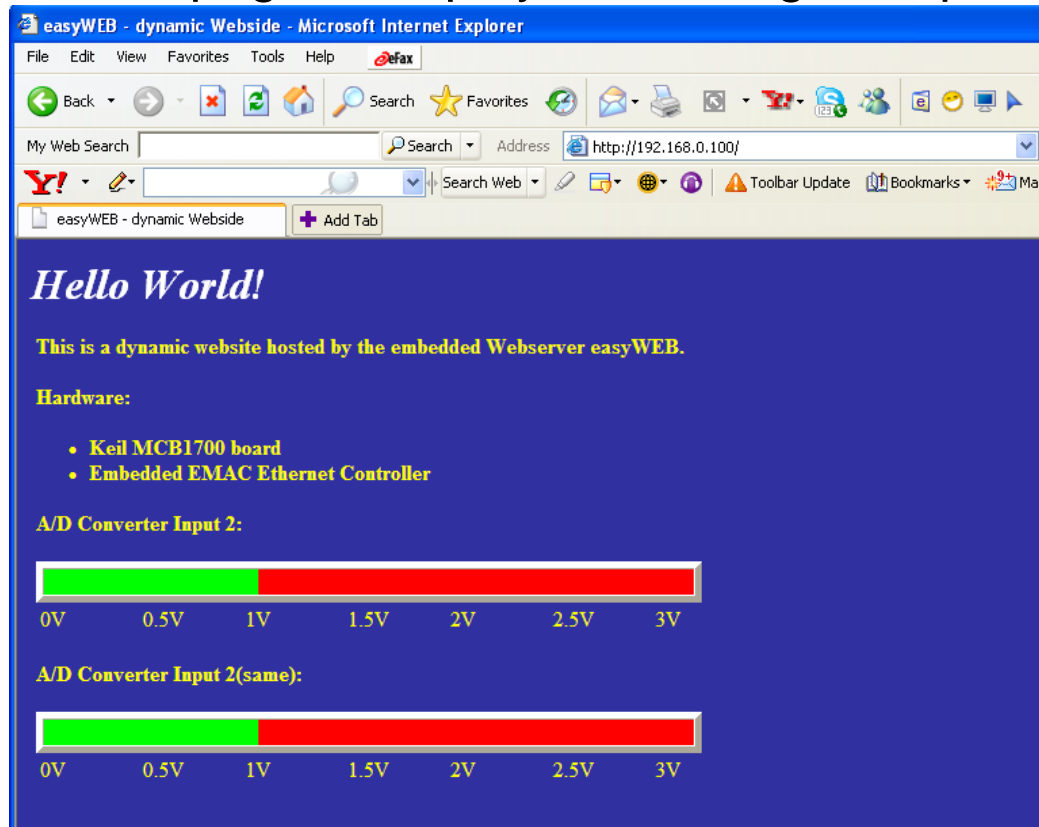
- ▶ Open Internet Explorer
- ▶ Go to “Tools > Internet Options > Connections > LAN Settings”
  - Make sure no proxy servers are used



# EasyWEB example using JTAG debugger



## Step 10: Accessing the web page (cont.)

- ▶ Point your browser to `http://192.168.0.110`
- ▶ Embedded web server page is displayed – change the potentiometer...



# EasyWEB example using JTAG debugger

## Step 11: Closing the example

- ▶ Click 'Halt'  to stop the program execution
- ▶ Click  to stop the debugging session
- ▶ Go to "Project > Close Project" to close the project (if desired)
- ▶ Click "File > Exit" to close uVision3 (if desired)

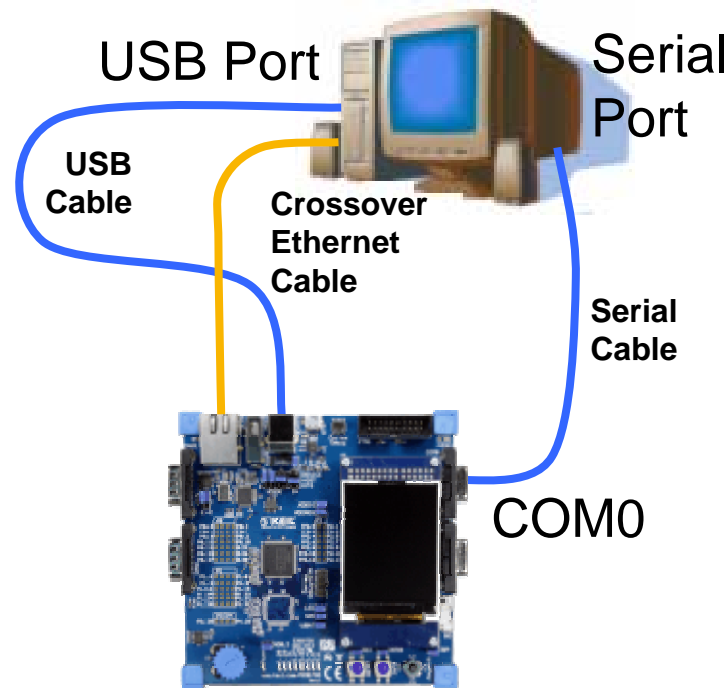
**Running the EMAC / EasyWEB  
example from the LPC1700 Sample  
Code Bundle using the FlashMagic  
ISP software**

# EasyWEB example using FlashMagic

## Step 1: Hardware Setup

- ▶ Make sure your computer and your board are connected as shown
- ▶ This powers the board, provides the Ethernet connection between the MCB1700 to the PC, and provides for ISP programming

**Note:** Make sure the RST and ISP jumpers are **closed** on the MCB1700 board:



**Note:** Move the E/C and the E/U jumpers on the MCB1700 board to the upper (E) position:



# EasyWEB example using FlashMagic

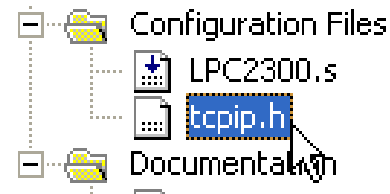
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- ▶ Open the project by double-clicking on file “easyweb.uv2” here:  
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# EasyWEB example using FlashMagic

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- ▶ Change the IP address on your PC so it's in the same sub domain as your board:


- Open up a command window
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Command Prompt
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Ethernet adapter Local Area Connection:

    Connection-specific DNS Suffix  . : usbsjobay1rd.sc.philips.com
    IP Address. . . . . : 134.27.39.105
    Subnet Mask . . . . . : 255.255.255.0
    Default Gateway . . . . . : 134.27.39.254
```

- To change the IP address of your PC Ethernet adapter, do this:
  - Open Windows Explorer 
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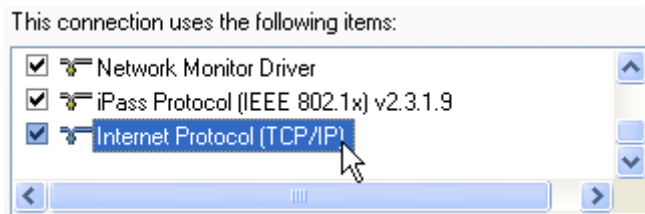




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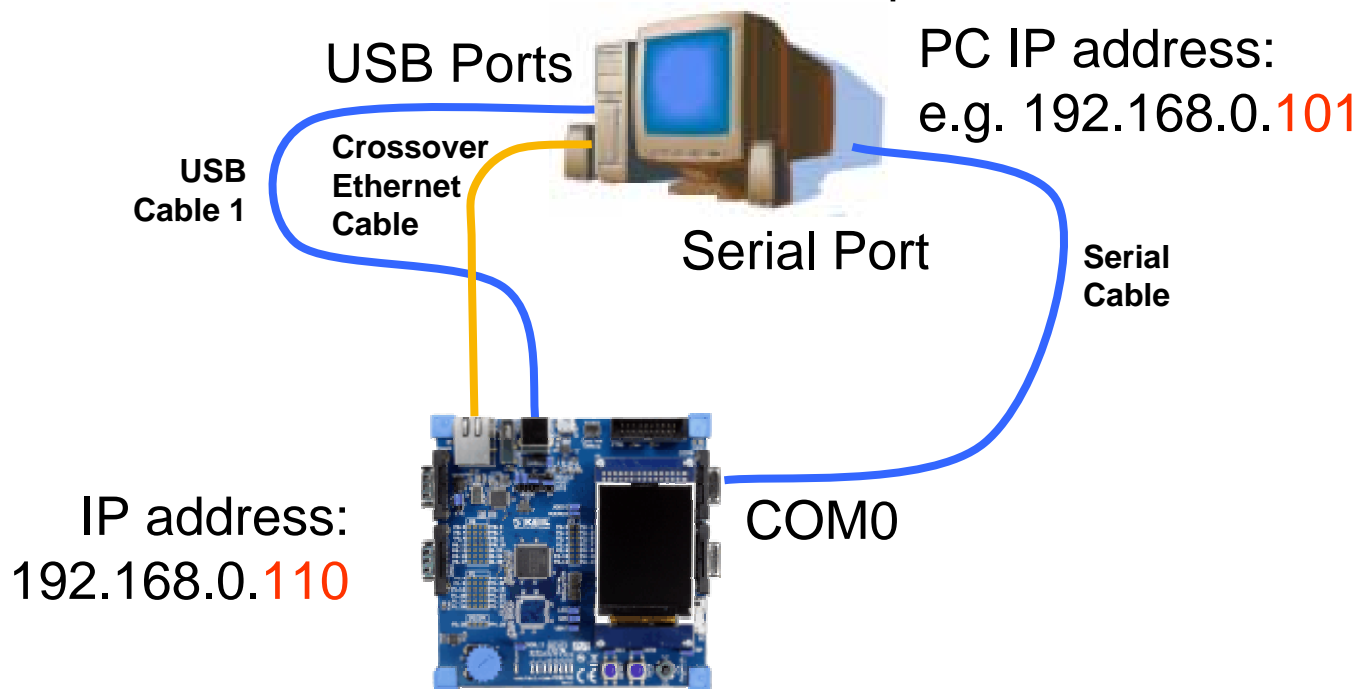
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Subnet Mask . . . . . : 255.255.255.0
Default Gateway . . . . . :
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# EasyWEB example using FlashMagic

## Step 5: Verifying the LAN setup

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# EasyWEB example using FlashMagic

## Step 6: Compiling the example project

- ▶ Make sure the uVision3 Target setting is 'FLASH'



- ▶ Build the project clicking the “Rebuild all target files”-button



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Build target 'FLASH'
assembling startup_LPC17xx.s...
compiling system_LPC17xx.c...
compiling easyweb.c...
compiling EMAC.c...
compiling tcpip.c...
linking...
Program Size: Code=7660 RO-data=1796 RW-data=84 ZI-data=1508
FromELF: creating hex file...
".\FLASH\easyWeb.axf" - 0 Error(s), 0 Warning(s).
```

- ▶ As you can see, a .hex file is created in the progress...

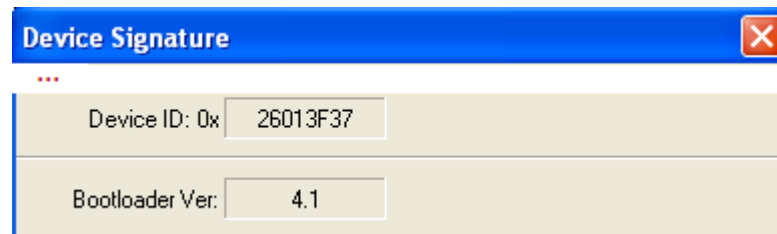
- If not, check the 'Create HEX File' box under  
'Project > Options for Target 'FLASH' > Output':



# EasyWEB example using FlashMagic

## Step 7: Setting up FlashMagic

- ▶ Make sure no other program is using the serial port (e.g. TeraTerm, Hyperterminal, etc.)
- ▶ Make sure the serial cable is connected to the PC and to COM0 (=UART0) on the MCB1700 board
- ▶ Launch FlashMagic application
- ▶ To make sure you're connected to the LPC1768, click "ISP > Read Device Signature" and look for the following response:



- If you get an error message instead, check your connections...

# EasyWEB example using FlashMagic

## Step 8: Programming the code to on-chip Flash

- ▶ Make the following selections:

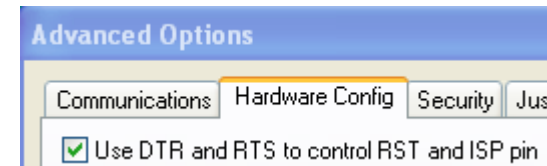


Step 1 - Communications

Device:	LPC1768
COM Port:	COM 1
Baud Rate:	19200
Interface:	None (ISP)
Oscillator (MHz):	12.000000

- ▶ Go to “Options > Advanced Options > Hardware Config”

- Make sure the following box is checked:

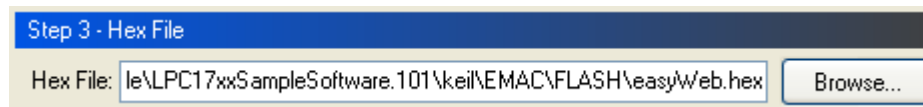


Advanced Options

Communications Hardware Config Security Jus

☒ Use DTR and RTS to control RST and ISP pin

- ▶ Use the “Browse” button to select the EMAC project hex file:  
...\\LPC17xxSampleSoftware.xxx\\keil\\EMAC\\FLASH\\easyWeb.hex



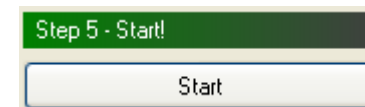
Step 3 - Hex File

Hex File: \\LPC17xxSampleSoftware.101\\keil\\EMAC\\FLASH\\easyWeb.hex

Browse...

- ▶ Click Start!

- FlashMagic programs the selected hex file into the LPC1768



Step 5 - Start!

Start

# EasyWEB example using FlashMagic

## Step 9: Running the example

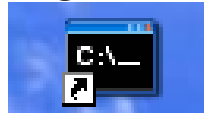
- ▶ The program should already be running...
- ▶ If not, press Reset Button to start code execution

# EasyWEB example using FlashMagic

## Step 10: Pinging your board from your PC

- ▶ Try to ping your board from your PC:

- Open up a command window



- Type `ping 192.168.0.110` to ping your target board.

```
C:\Documents and Settings\usb\\Desktop>ping 192.168.0.110

Pinging 192.168.0.110 with 32 bytes of data:

Reply from 192.168.0.110: bytes=32 time<1ms TTL=64
Reply from 192.168.0.110: bytes=32 time<1ms TTL=64
Reply from 192.168.0.110: bytes=32 time<1ms TTL=64
Reply from 192.168.0.110: bytes=32 time<1ms TTL=64

Ping statistics for 192.168.0.110:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 0ms, Average = 0ms

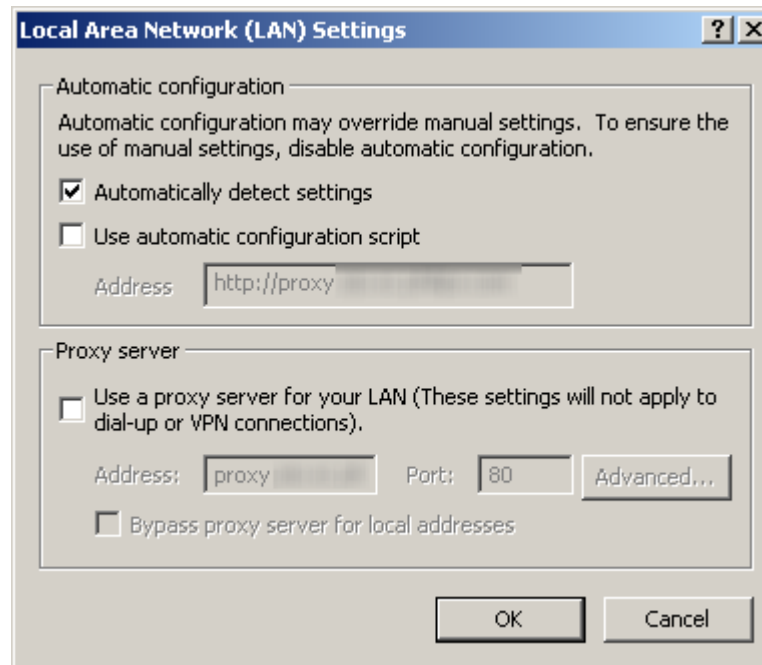
C:\Documents and Settings\usb00224\Desktop>_
```

- ▶ Note the orange LED (on the Ethernet connector of the MCB1700 Board) flashes every time an Ethernet frame is received

# EasyWEB example using FlashMagic

## Step 11: Accessing the web page

- ▶ Open Internet Explorer
- ▶ Go to “Tools > Internet Options > Connections > LAN Settings”
  - Make sure no proxy servers are used





# EasyWEB example using FlashMagic

## Step 11: Accessing the web page (cont.)

- ▶ Point your browser to `http://192.168.0.110`
- ▶ Embedded web server page is displayed – change the potentiometer...

