NET+Works with GNU Tools Tutorial

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Using This Guide

Review this section for basic information about this guide, as well as for general support contact information.

About this guide

This guide describes NET+OS with GNU Tools and how to use it as part of your development cycle. Part of the NET+Works integrated product family, NET+OS is a network software suite optimized for the NET+ARM.

Software release

This guide supports NET+OS 6.2. By default, this software is installed in the `C:\netos62_gnu` directory.

Who should read this guide

This guide is for software engineers and others who use NETWorks for NET+OS.

To complete the tasks described in this guide, you must:

- Be familiar with installing and configuring software.
- Have sufficient user privileges to do these tasks.
- Be familiar with network software and development board systems.

Conventions used in this guide

This table describes the typographic conventions used in this guide:

This convention	Is used for
italic type	Emphasis, new terms, variables, and document titles.
bold, sans serif type	Menu commands, dialog box components, and other items that appear on-screen.
menu name → option	Menu commands. The first word is the menu name; the words that follow are menu selections.
`monospaced type`	Filenames, pathnames, and code examples.

Related documentation

- *NET+Works Quick Installation Guide* describes how to install the hardware.
- *NET+Works with GNU Tools BSP Porting Guide* describes how to port the board support package (BSP) to a new hardware application with GNU tools.
- *NET+Work swith GNU Tools Programmer's Guide* describes how to use NET+OS to develop programs for your application and hardware.
- NET+Works online help describes the application programmer interfaces (APIs) that are provided with NET+OS.

For information about third-party products and other components, review the documentation CD-ROM that came with your development kit. The online help is located in `C:\netos62_gnu\Documentation`.

For information about the processor you are using, see your NET+Works hardware documentation.

Documentation updates

NetSilicon occasionally provides documentation updates on the Web site.

Be aware that if you see differences between the documentation you received in your NET+Works package and the documentation on the Web site, the Web site content is the latest version.

Customer support

To get help with a question or technical problem with this product, or to make comments and recommendations about our products or documentation, use the contact information listed in the next tables.

NetSilicon support

For	Contact information
Technical support	Telephone: 1 800 243-2333 / 1 781 647-1234 Fax: 1 781 893-1388 E-mail: tech_support@netsilicon.com
Documentation	techpubs@netsilicon.com
NetSilicon home page	www.netsilicon.com
Online problem reporting	www.netsilicon.com/support/problemreporting.jsp

Digi support

For	Contact information
Technical support	Telephone: 1 877 912-3444 / 1 952 912-3456 Fax: 1 952 912-4960
Documentation	techpubs@digi.com
Digi home page	www.digi.com
Online problem reporting	www.digi.com/support/eservice/eservicelogin.jsp

Welcome to the NET+Works with GNU Tools Tutorial

In this hands-on exercise, you will:

- Set up a MAJIC or Raven debugger.
- Build and download a sample application.
- Run and debug the sample application.
- Specify configuration options for the development board.

Note The tutorial is brief — approximately 20 minutes — so you will be able to complete it in one sitting.

Task 1: Preparing to do the tutorial

This section describes what you need to do before you get started.

Make sure the hardware and software are installed

Verify that the hardware and the NET+Works 6.2 software are installed.

If you need to do the installation, see the *Quick Installation Guide*. The software installation uses a wizard to guide you through the process.

The instructions in this guide are based on the assumption that NET+Works is installed in the default installation directory:

```
C:/netos62_gnu
```

Gather information you'll need (MAJIC only)

See your network administrator for the information in the list shown next. You'll use this information when you set up the MAJIC's IP address and when you configure the development board.

You may find it helpful to write down the information in the spaces provided.

- IP address for the board:

  _____

- IP address for the MAJIC:

  _____

- Subnet mask:

  _____

- Default gateway:

  _____

- MAC address:

  _____

What's next?

Go right on to the next section; you can begin the tutorial.

Task 2: Setting up your debugger

In this section, if you're using a MAJIC probe, you'll make software configuration settings. The EPI MAJIC Setup Wizard guides you through this process, in which you'll make selections and provide information.

If you're using a Raven debugger, you'll install it.

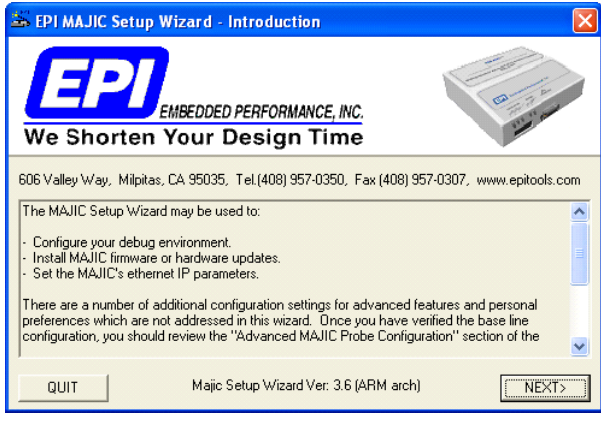
Configuring the MAJIC probe

▶ **To configure the MAJIC probe:**

1 Set up an MDI server icon – the interface between the gdb and the MAJIC – by doing one of these steps:

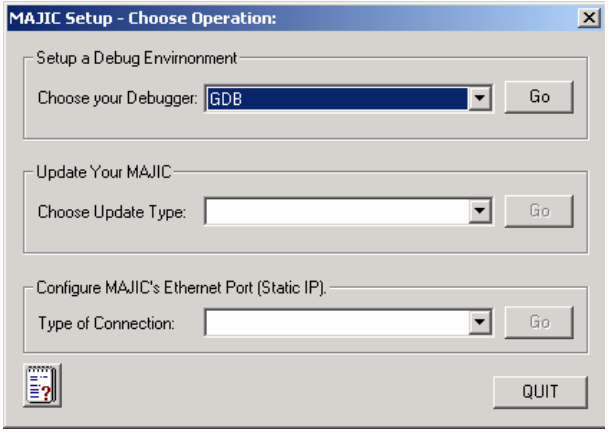
- Windows XP systems. Select **Start** → **All Programs** → **EPI Tools-EDTA 2.2a** → **MAJIC Setup Wizard.**
- Windows 2000 systems. Select **Start** → **Programs** → **EPI Tools-EDTA 2.2a** → **MAJIC Setup Wizard.**

The EPI MAJIC Setup Wizard Introduction window opens:



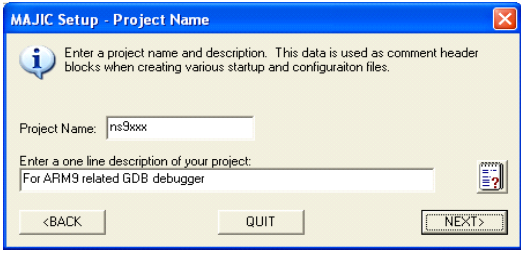
2 After you review the introduction, click **NEXT.**

The **Choose Operation** window opens:



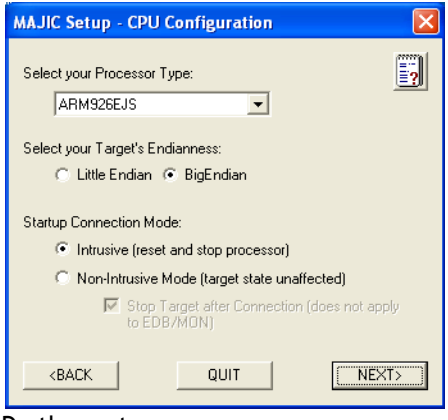
3 From the **Choose Your Debugger pulldown menu**, select **GDB** and click **Go**.

The **Project Name** window opens:



4 Create a new project by entering a project name and a brief description. Then click **NEXT**.

The **CPU Configuration** window opens:



5 Do these steps:

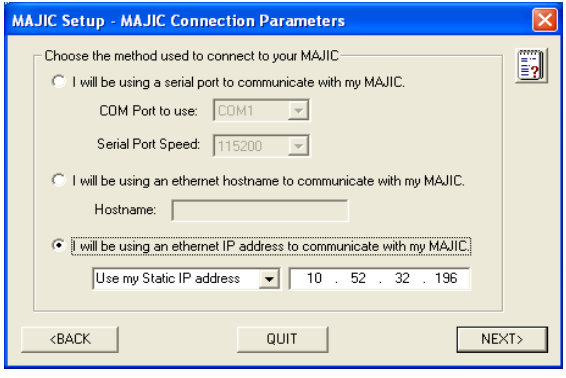
a From the **Select Your Processor Type pulldown menu**, select **ARM926EJS**.

b Under **Select your Target's Endianness**, click **BigEndian**.

c Under **Startup Connection Mode**, click **Instrusive Mode (reset and stop processor)**.

and then click **NEXT**.

The **MAJIC Connection Parameters** window opens:



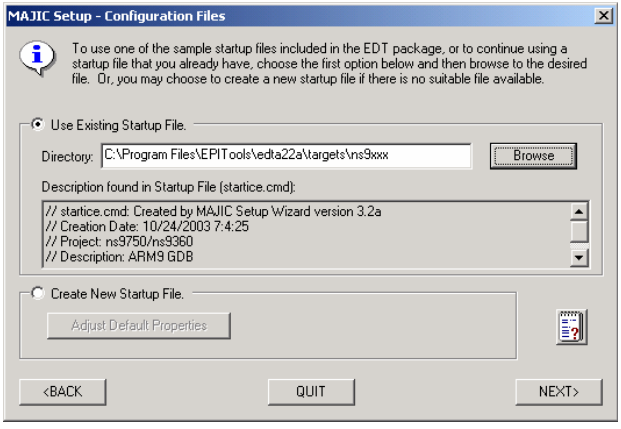
6 Do these steps:

a Click **I will be using an Ethernet IP address to communicate with my MAJIC**. Then enter the IP address for the MAJIC.

b Make sure **Use My Static IP address** is selected.

and then click **NEXT**.

The **Configuration Files** window opens:



7 Click **Use Existing Startup File.**

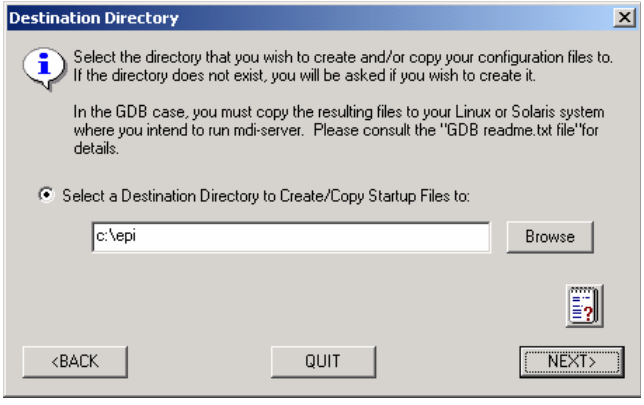
Then do these steps:

a Click **Browse.**

b Navigate to the **Program Files** → **EPI Tools** → **edta22a** → **Targets** → **ns9xxx** directory, click the `startice.cmd` file, and click **Open.**

and then click **NEXT.**

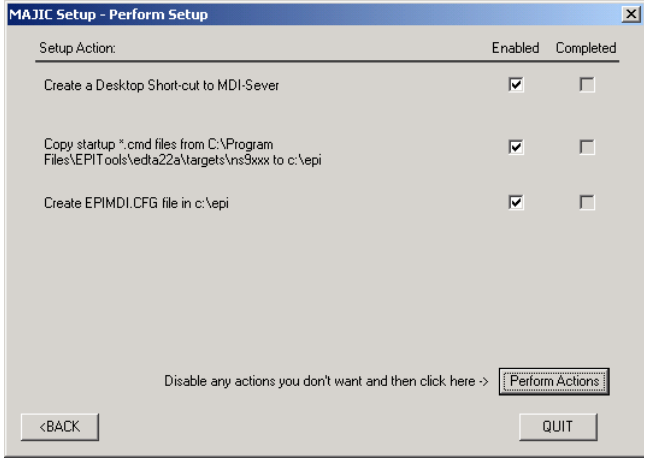
The **Destination Directory** window opens:



8 Click **Select a Destination Directory to Create/Copy Startup Files to.**

Then browse to the directory you want to use for files that are created or copied during the MAJIC setup, and click **NEXT.**

The **Perform Setup** window opens with a summary of your selections:



9 Check **Enabled** for each item, then click **Perform Actions**.

This step creates MAJIC setup files in the directory you specified in step 8. The setup program also creates a shortcut to the MDI server on your desktop.

10 To exit from the wizard, click **Done**.

Installing the Raven debugger

▶ **To install the Raven:**

1 Get a cable with a 20-pin connector for the Raven.

(The Raven has both a 14- and a 20-pin cable installed.)

2 Connect the parallel cable from the Raven debugger to the parallel port on your PC.

What's next?

You're ready to go on to the next section to set up the IP address of your MAJIC probe.

If you're using a Raven debugger, you can skip Task 3 and go right to Task 4.

Task 3: Setting up the IP address of the MAJIC probe

This section describes how to set up the IP address of the MAJIC probe. In this procedure, you'll use the information you got from your network administrator.

You'll use the EPI MAJIC Setup Wizard for this procedure.

If you're using a Raven debugger, skip this section and go right to "Task 4: Start a terminal session."

▶ **To set up the MAJIC's IP address:**

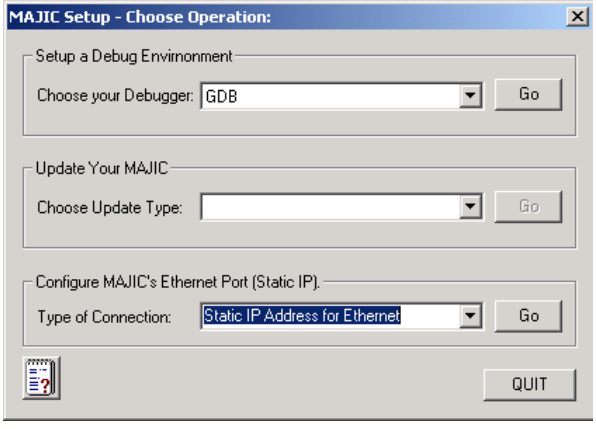
1 Do one of these steps:

- Windows XP systems. Select **Start** → **All Programs** → **EPI Tools-EDTA 2.2a** → **MAJIC Setup Wizard.**
- Windows 2000 systems. Select **Start** → **Programs** → **EPI Tools-EDTA 2.2a** → **MAJIC Setup Wizard.**

The **EPI MAJIC Setup Wizard Introduction** window opens:

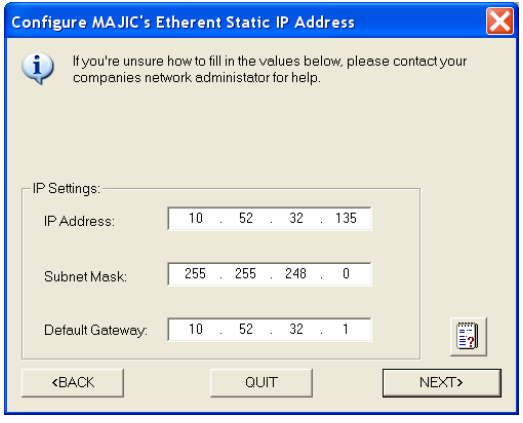
2 Click **NEXT.**

The **Choose Operations** window opens:



3 From the **Type of Connection** pulldown menu, select **Static IP Address for Internet**, and then click **Go** (as indicated by the arrow).

The **Configure MAJIC's Ethernet Static IP Address** window opens:

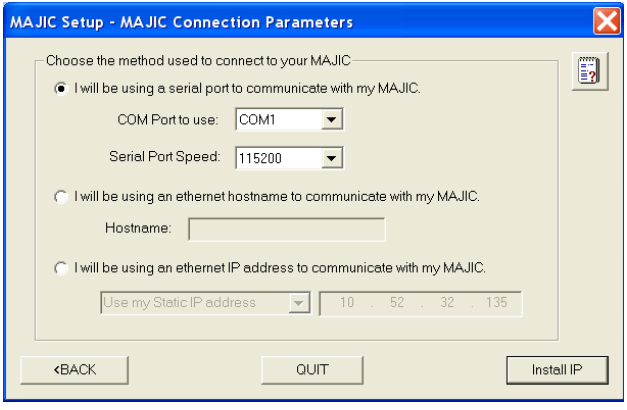


4 Enter the information you got from you network administrator:

- IP address
- Subnet mask
- Default gateway

and then click **NEXT.**

The **MAJIC Connection Parameters** window opens:



5 Do these steps:

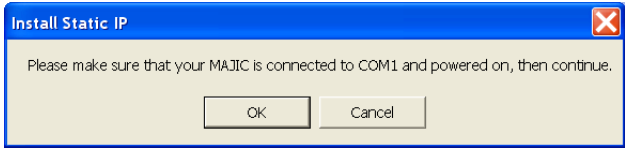
a Click **I will be using a serial port to communicate with my MAJIC.**

b Connect the MAJIC serial cable between the MAJIC JTAG interface controller's serial port and an available COM port on your PC.

c From the **COM port to use** pulldown menu, select the serial port number. Make sure no other programs are using the COM port you select.

d Click **Install IP.**

The **Install Static IP** dialog box opens:



6 Verify that the serial cable is attached from your PC to the MAJIC probe, and then click **OK.**

A dialog box and a DOS window open.

7 In the **Check Your Installation Result** dialog box, confirm that the IP address information in the DOS window is correct by clicking **OK.**

If there is a problem, correct the problem and go back to step 1 of this section.

8 Connect an Ethernet cable from your MAJIC probe to your LAN hub or switch.

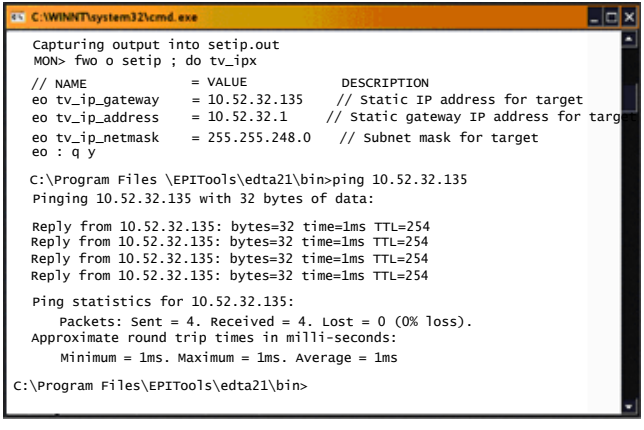
9 After the MAJIC probe turns off, power cycle the MAJIC.

10 In the DOS window, ping the IP address by entering:

`ping` *`IP_ADDR`*

where *`IP_ADDR`* is the IP address of the MAJIC.

This is what you see in the DOS window:



Note that the colors of the text and background are reversed in this document for easier reading.

If the `ping` succeeds, the IP address is installed.

11 Close the DOS window.

12 In the **Check Your Install Results** dialog box, click **OK**.

What's next?

In the next section, you'll start a terminal session.

Task 4: Start a terminal session

From your PC, open a terminal connection to the development board so you can view outputs from the board. Although several applications are available for this purpose, this tutorial uses HyperTerminal.

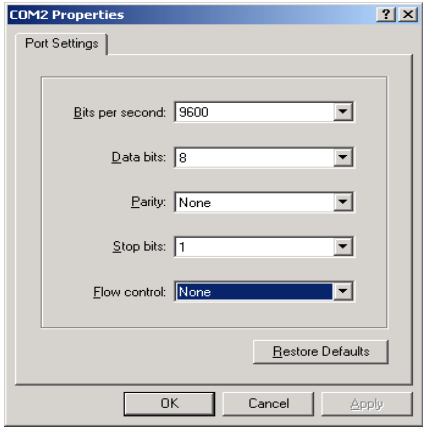
As you go through the tutorial, keep the HyperTerminal window open for quick access.

▶ **To open a HyperTerminal window:**

1 Do one of these steps:

- Windows XP systems. Select **Start** → **All Programs** → **Accessories** → **Communications** → **HyperTerminal**.
- Windows 2000 systems. Select **Start** → **Programs** → **Accessories** → **Communications** → **HyperTerminal**.

2 Use the settings shown here:



This example uses COM2; use the available port on your system.

3 When you finish reviewing or changing settings, click **OK**.

What's next?

You're ready to build the BSP and the sample application, and then download the application.

Task 5: Building and downloading the template application

In this section, you will build the BSP and Hello World, one of the template applications provided with NET+Works. This simple application writes Hello World to the HyperTerminal window (which you opened in Task 4).

After you build, you'll download the application.

These instructions are for both the MAJIC and the Raven.

Building the BSP

In typical use, you don't need to build the BSP every time you build an application. In your first use of the software, however, you *must* first build the BSP, and then build your application.

▶ **To build the BSP:**

1. Double-click the **NET+Works 6.2 Build Environment** icon on your desktop.

   An X-Tools window opens.

2. Change to the directory that contains the BSP:

   ```
   cd c:/netos62_gnu/src/bsp
   ```

   and press Enter.

3. To build the BSP, enter this command:

   ```
   make PLATFORM="my platform" clean all
   ```

   and press Enter.

   The build takes several minutes to complete; during this time, you don't see any activity on the screen.

Building the template application

▶ **To build the template application:**

1 Change to the directory in which the template resides:

`cd c:/netos62_gnu/src/apps/template/32b`

and press Enter.

2 If you are using a MAJIC, enter this command:

`make PLATFORM="my platform" gdbinit`

and press Enter.

This step creates a `.gdbinit file`, which is the GNU debugger initialization file. This is the only time you'll use this command.

3 If y ou're using a Raven debugger, do one of these steps:

- **ARM9**. Copy `c:/netos62_gnu/debugger_files/gdbns9xxx.raven` to the `32b` folder for your application, and rename it `.gdbinit`.
- **ARM7**. Copy `c:/netos62_gnu/debugger_files/gdb`*`yourplatform`*`.raven` to the `32b` folder for your application, and rename it `.gdbinit`.

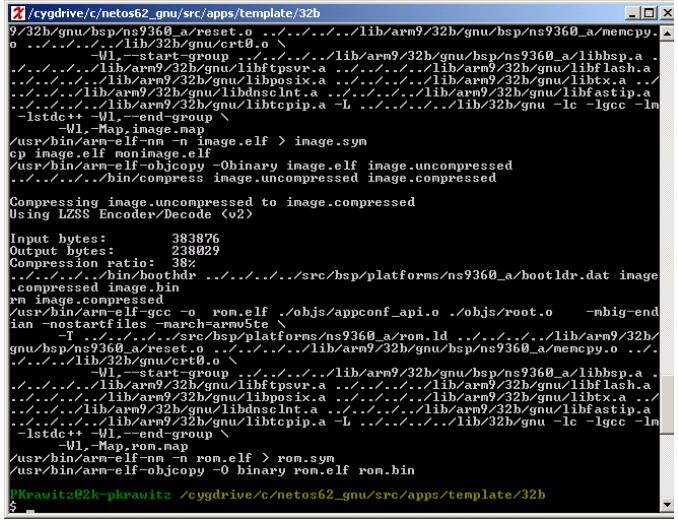
For example, your platform could be `connectsp`.

4 To build the application, enter this command:

`make PLATFORM="my platform"`

and press Enter.

This command builds the `image.elf` file, which is the image you'll download to the debugger, and `rom.bin`, which is the corresponding ROM image. This process, which you can see in the console, takes a few seconds.



Downloading the template application

▶ **To download Hello World:**

1 Power cycle the development board and the MAJIC or Raven.

2 Do one of these:

- If you are using a Raven, click either the `ocdremote` ARM7 or ARM9 icon.

  If you get Error 43, check whether your board has power and the Raven is connected properly, and then try again.

  (If the window closes immediately, or is blank, power-cycle your board and try again.)

- If you are using a MAJIC, click the MDI server icon on your desktop.

3 Make sure you are in an arm -elf shell. If you are not, enter this command:

```
xtools arm -elf
```

and press Enter.

4 To start up gdb – the debug environment – enter this command:

```
gdbtk -se image.elf
```

and press Enter.

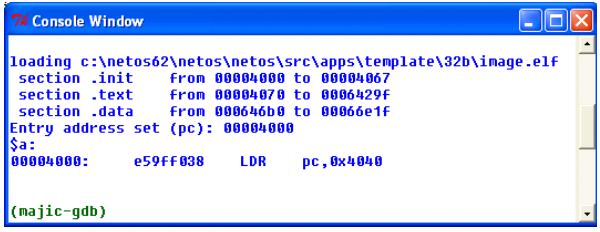
If you are using a Raven, when you see a pop-up window with this message:

```
The target may not be able to correctly handle
a memory-write-packet-size of 1024 bytes.
Change the packet size?
```

Click **Yes**.

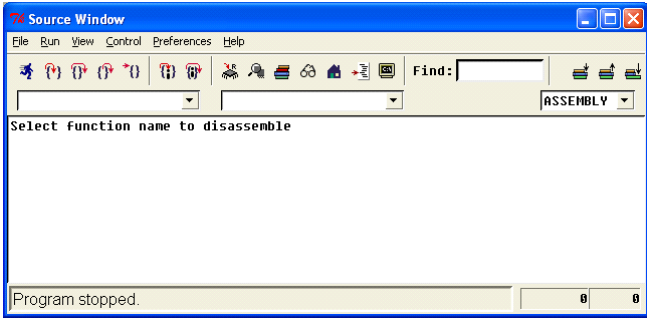
The debugger **Console** window opens, and the download begins.

If you are using a Raven debugger, and you see errors in the **Console** window, power-cycle your board, and do this step again.



This process takes about a minute to complete.

Then the debugger **Source** window opens:



What's next?

Now you're ready to run and debug the template application. Go on to the next section.

Task 6: Running and debugging the template application

You run and debug your application in the debugger window. The instructions in this section are for both the Raven and the MAJIC.

Running the application

▶ **To run the template application, do one of these steps:**

- *Either* select **View→ Console**.

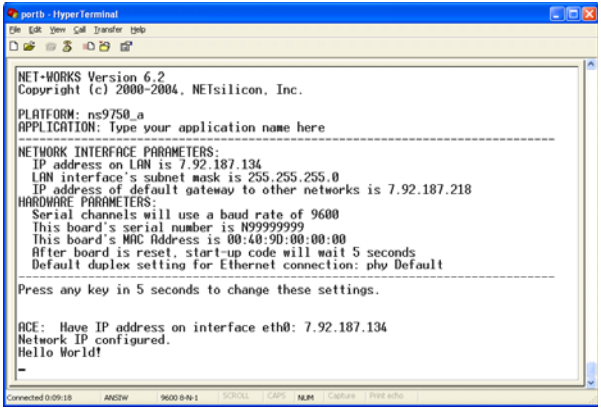
  A GNU **Console** window opens.

  In the **Console** window, enter `c` and press Enter.

- *Or* in the **Source** window, click this icon:

  →{ }

The application appears in the terminal window:



Note that Hello World appears in the last line of the window.

Debugging the application

▶ **To debug the template application:**

1 In the **Source** window, click **Stop**.

When you see this warning, which is not a fatal error, click **OK**:

2 Enter this command in the **Console** window:

`b` *`function name`*

where you replace *`function name`* with the function at which you want to insert the break point

and then press Enter.

For this example, enter:

```
b applicationStart
```

3 Close the debugger by closing the **Source** window.

4 To start up gdb (the debug environment), enter this command in the X-Tools window:

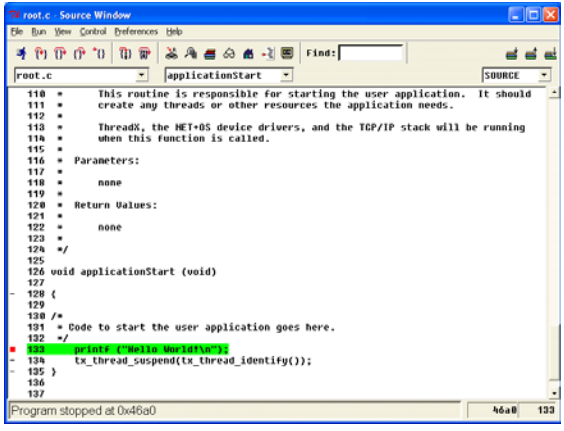
```
gdbtk -se image.elf
```

and press Enter.

5 To continue to run the program, in the **Console** window, enter `C`

and then press Enter.

You see this window:



What's next?

Go on to the next section to configure the development board.

Task 7: Configuring the development board

During this procedure, be prepared to move quickly to your HyperTerminal at step 10, because you have only a few seconds to respond to the prompt.

▶ **To configure the development board:**

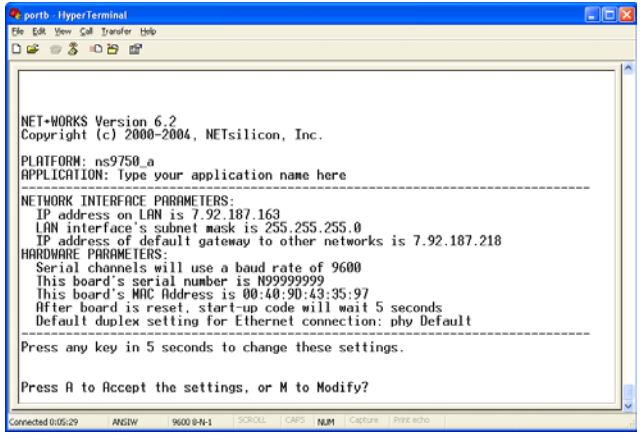
1. Reboot the development board by disconnecting it from the power source and then reconnecting it.
2. Change to this directory:

   ```
   cd c:/netos62_gnu/src/apps/template
   ```

3. In the `appconf.h` file, verify that the `USE_NVRAM` define is set to `1`.

   If you need to change this setting, you must rebuild your application.
4. Run the application again as you did in Task 5, in the section “Downloading the template application.”
5. Go to the PC that’s running HyperTerminal, and press Enter.

   You see this information in the HyperTerminal window:



6. To change the configuration, press M and then press Enter.

   You are prompted for a password.
7. Enter `Netsilicon`, the default password, and press Enter.

   The first of a series of configuration prompts appears.

8 At each prompt, do one of these steps:

- To accept the current value, press Enter.
- To change a setting, enter a value and press Enter.

After you scroll through the settings, a prompt indicates that you must press a key within five seconds if you want to change additional settings.

When you finish this procedure, you will have completed the tutorial.

Tips and suggestions

Now that you've completed the exercise, here are some tips for when you start using NET+Works with GNU Tools with your own projects.

Where should I put my code, and why?

Add your code as an example off of the `netos62_gnu/src/` examples directory. The software calls the `applicationStart` function in the `root.c` file.

Start by duplicating some other example and modify the makefiles. (For information about modifying makefiles, see the *NET+OS with GNU Tools BSP Porting Guide*).

A good choice is `naftpapp`, which is the FTP server example. It may make sense to add your application to this example. It will allow you reload new code after it's running in flash. Modify `root.c` to load your specific application, and modify `appconf.h` for your board settings.

What should my next step be?

The next step should be running your application from flash. The flash code is broken up into 2 parts: the bootloader and your application. The bootloader (`rom.bin`) is located in the `netos62_gnu/src/bsp/platforms/`*`your platform`* directory. Your application (`image.bin`) is located in the `netos62_gnu/src/examples/`*`your example`*`/32b` directory.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