



Opal-RT Technologies

OPAL-RT: IT Network Setup Procedure

Internal documentation: v3.0



1 Revision history

Revision 1.0	IT Network Procedure	Keith Kukolich
Revision 2.0	Updates and Revision	Keith Kukolich
Revision 3.0	Updates from Francois B.	Keith Kukolich



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3 Introduction:

3.1 Statement of Purpose

In order to prepare for the most efficient and successful RT-LAB software installation and training, it is necessary to have a complete Windows Host PC setup which involves network administrator setup to fully prepare the configuration for communication with the Real-Time target computer and running the RT-LAB Host applications. This step-by-step procedure is intended for the network administrator or Field Applications Engineer at a client site to complete prior to RT-LAB software installation through the mega-installer. Ideally, this procedure will be completed 1-2 weeks in advance of the onsite visit. Due to many issues faced at customer sites with RT-LAB host configuration and networking setup, it is highly recommended that this procedure be followed prior to training and system commissioning.



Figure 1 RT-LAB OP5600: Windows Host PC and Real-Time Target (QNX or Redhat) Configuration

3.2 Prerequisites

- Designated Windows XP/7 Host PC
- Knowledge of Networking configuration settings in Windows XP/7
- Prepared to Connect Real-Time Target to Ethernet switch, company network, or directly between Host and Target PC
- Adding additional Host computer network cards if need separate Ethernet ports for Matlab, internet, and target communication
- Windows Firewall and 3rd Party Firewall configuration
- Received and Unpacked OPAL-RT OP5600 Real-Time Simulator



3.3 Overview

3.3.1 Network Settings and Computer Configurations:

Windows Host PC Procedure Steps:

1. Setup a Fixed IP address on the Windows Host computer.
2. Disable Windows Firewall and other Network Firewalls
3. Matlab (32-bit version) installation and License Activation.

Real-Time Target (QNX or Redhat) Procedure Steps:

1. Power Up and Connect Real-Time Target computer.
2. Setup a Fixed IP address in QNX or Redhat.
3. Configure OS settings

RT-Lab Post-installation

1. Target verification: ping, ftp, and telnet procedure
2. Firewall settings for RT-LAB processes

Appendix

1. QNX Target commands
2. Trouble-Shooting the Target



4 Set Fixed IP addresses for RT-Lab

For the RT-Lab Ethernet communication to work between HOST and TARGET computers, it is necessary to have fixed IP addresses for both. The QNX or Redhat target has a Fixed IP address, which can be changed using QNX command line or Photon. The Windows XP/7 HOST PC must have set a Fixed IP address in order connect to the Real-Time Target computer.

If the IP address of HOST PC has changed:

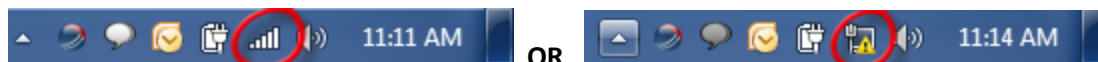
The Windows HOST PC must have a fixed IP address: 192.168.10.XXX. The First 3 sets of numbers must match that of the Target PC (subnet) and the last number must be different than the TARGET IP ADDRESS.

For example: **WINDOWS XP/7 HOST IP ADDRESS** 192.168.10.105.

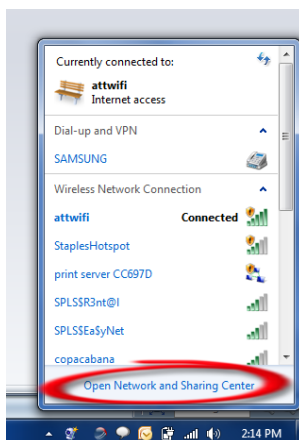
QNX 6.X OR REDHAT TARGET IP ADDRESS 192.168.10.101

4.1 To Set FIXED IP ADDRESS FOR WIN7 RT-LAB HOST PC:

1. Left- Click on the Windows Task Bar Wireless or Network Icon



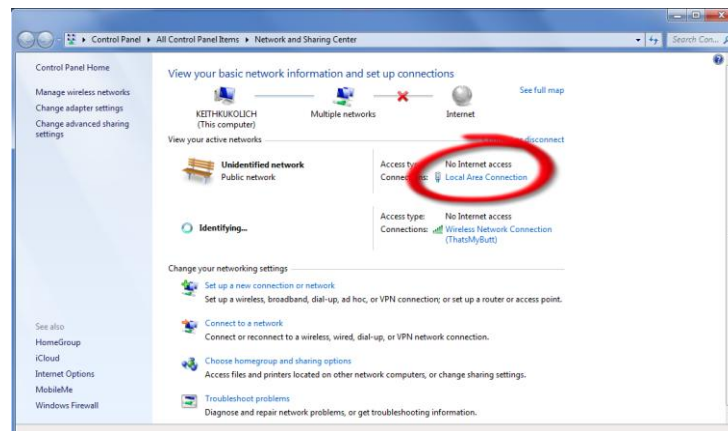
2. Click on "Open Network and Sharing Center".



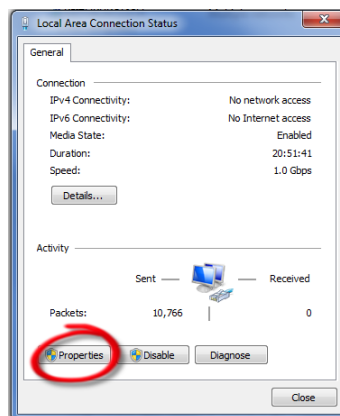
Note: Alternatively, you can Open Windows 7 **Start** Icon > Left-Click on **Connect To**



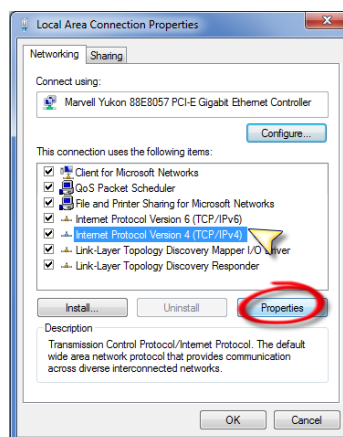
3. Click On: **Local Area Connection**



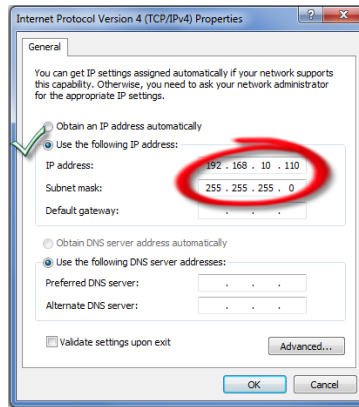
4. Select **Properties**



5. Highlight **Internet Protocol (TCP/IP)**. Select **Properties**



6. Manually Set IP address. Select “Use the following IP address” and Enter **IP address** and **Subnet mask**: (IP address must have same first 3 numbers and different 4th number as your QNX target).



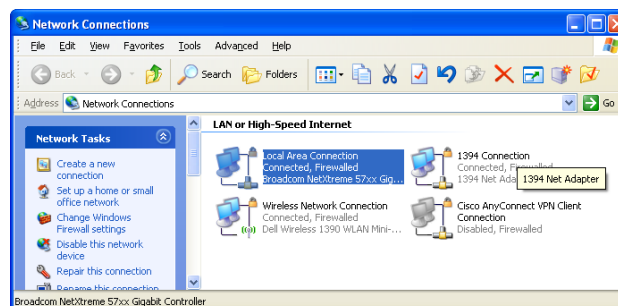
4.2 To Set FIXED IP ADDRESS FOR WIN-XP RT-LAB HOST PC:

1. From **Start Menu** on Windows XP Host PC, Select **Connect to > Show all connections**.

(OR: Open Control Panel > Network Connections)

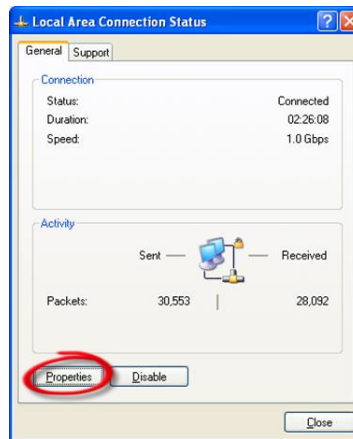


2. Open Windows Network Connections: **Local Area Connection**

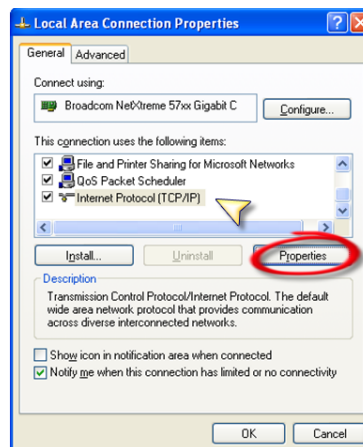




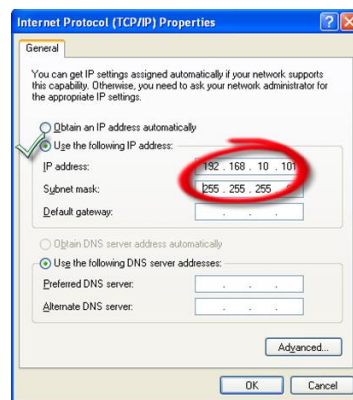
3. Select **Properties**



4. Highlight **Internet Protocol (TCP/IP)**. Select **Properties**



5. Manually Set IP address. Select **Use the following IP address** and Enter **IP address** and **Subnet mask**: (IP address must have same first 3 numbers and different 4th number as your QNX target).





5 Host and Target Configuration

Once MATLAB 32-bit version has been installed, the Windows XP/7 Host computer will be prepared for RT-LAB software installation.

The OP5600 Real-Time Target simulator will next be configured to have a permanent fixed IP address set. It is necessary to power-up the Target computer to either verify the previously configured IP address or change the IP address for the user's client network subnet.

The OPAL-RT OP5600 Simulator runs either QNX or Redhat Real-Time Operating Systems.



Figure 2 OPAL-RT OP5600 Hardware-in-the-Loop Simulator and RT-LAB 10 Software

6 Connecting Monitor, Keyboard, and Mouse to OPAL-RT Simulator

Note: By default, the OPAL-RT Simulator will have the USB ports disabled. It is recommended that the user connect to the PS/2 mouse and keyboard connectors. A USB to PS/2 adapter can be used to connect USB keyboards and mice to the PS/2 ports on the OP5600 simulator.

6.1 Connect Cables

1. Connect the cables of the monitor and of the keyboard
2. Connect the VGA cable
3. Connect the PS/2 keyboard cable
4. Connect the PS/2 mouse cable (optional)

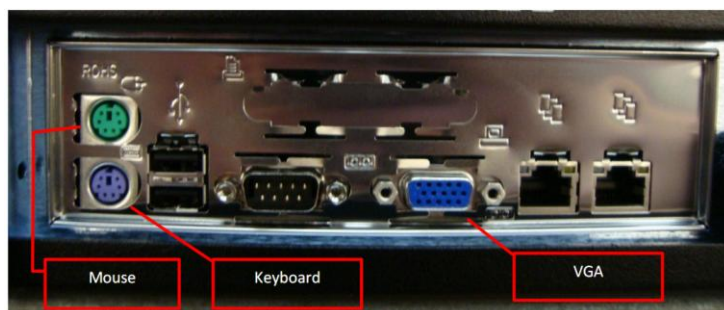


Figure 3 OP5600 (Front View) keyboard, Mouse, and VGA connectors

6.2 Power Up Target Power Supply

1. Turn on the power source
2. Connect the power cable
3. Flip the Power switch from **O** to **I** (Off to ON)

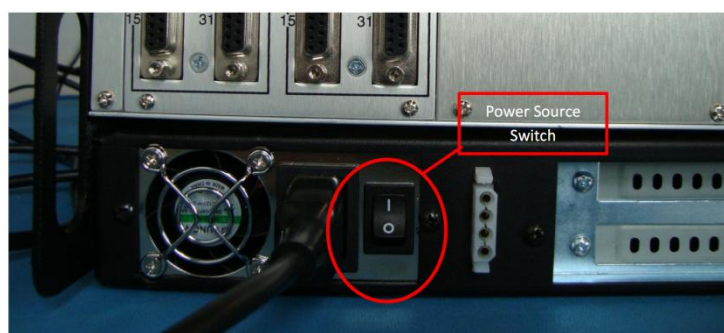


Figure 4 OP5600 (Front View) Power Switch.

6.3 Power ON Target computer

1. Check on the control panel in the front to make sure the green LED “Power” is on.

Note: It is normal that after the first power ON that the red LED “Overheat/Fan Fail” is on. This can occur on initial system start-up since the motherboard takes some time to receive the updated status that the CPU fans are running.

2. Press the button labeled “Power”.

Note: At this moment, a single« beep » sound should be heard and CPU fans should turn on.

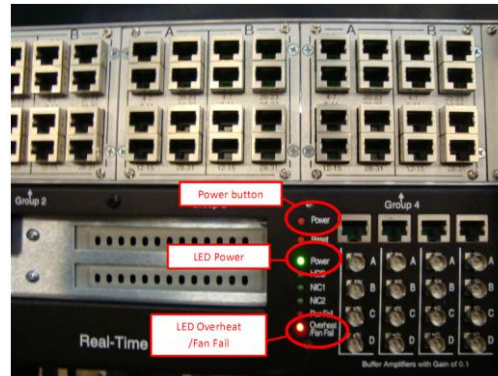


Figure 5 OP5600 (Front View) Power Button and LEDs.

Note: If it is necessary to change BIOS settings, the user can select to enter the BIOS right after power up. Depending on what can be seen on the monitor, press the key « Delete » , F2 or F11 on the keyboard.

6.4 Connect Ethernet cable to OP5600 Ethernet Port

1. Connect Ethernet cable to OP5600 Ethernet Port on the front panel.

Note: The Ethernet cable can connect either directly between Windows Host PC and OP5600 Target OR both Host and Target PCs can be connected to an Ethernet router/multi-port switch.

2. Connect opposite end of the Ethernet cable to Windows XP/7 Host PC.



Figure 6 OP5600 (Front View) Ethernet Port connection.

If there are multiple OPAL-RT Simulators to connect to the network, a router or multi-port switch can be used to connect them to the Windows Host PC. The Real-Time Target computers can exchange real-time communication signals using a Real-Time Link (Firewire, RTSI, Dolphin, etc.)



Figure 7 RT-LAB OP5600 Distributed Target Configuration

7 How to Open a telnet connection from RT-Lab

Note: RT-LAB 10 Software must be installed on the Windows Host PC prior to completing the following steps. If not already installed, follow the step-by-step RT-LAB installation steps in the Installation Guide provided with the CD or OPAL-RT download site (<http://www.opal-rt.com/downloads>).

1. First, right-click you target and select Tools>Telnet.

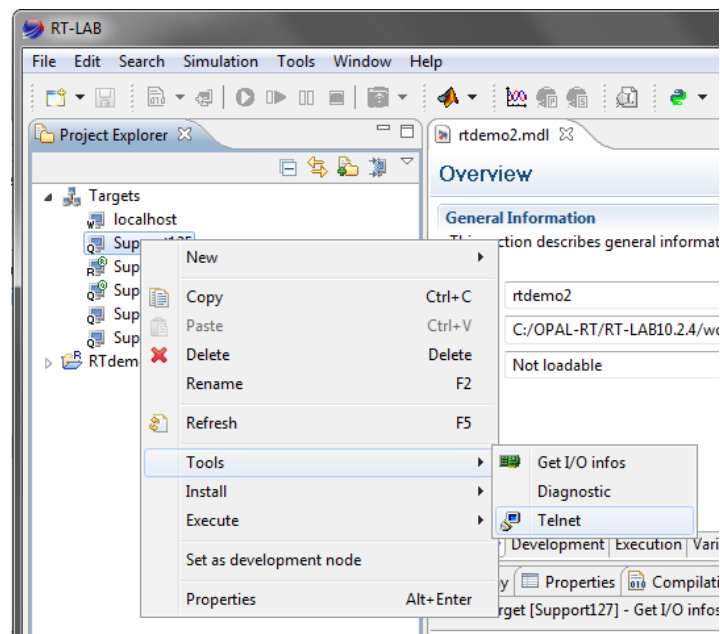


Figure 8 RT-LAB 10 Tools to Open Telnet connection to Target computer.

2. Press **Ok** in the Telnet “Terminal Settings” Window to open Telnet session.

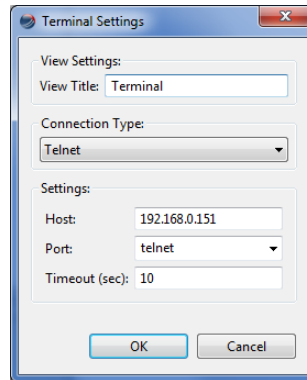


Figure 9 RT-LAB 10 Telnet Session: Terminal Settings

3. Login to QNX or Redhat Target to enter command line.

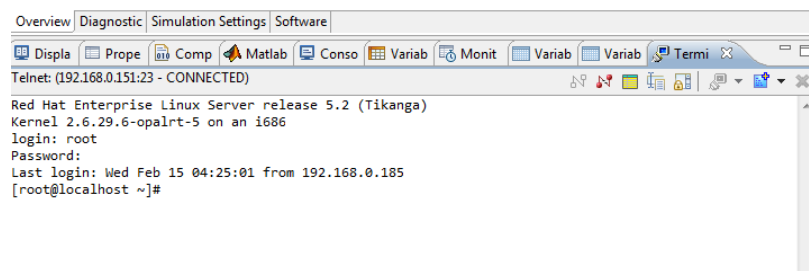


Figure 10 Telnet Terminal to Target

8 Windows Telnet connection with OPAL-RT Target

8.1 Open Telnet from Windows

How to do a telnet connection between the Windows Station and the RT-LAB QNX target:

1. Press Start windows button and go to the run command.
2. In the command port, type the command telnet xxx.xxx.xxx.xxx (where xxx.xxx.xxx.xxx represents the IP address ex: 192.168.0.130)

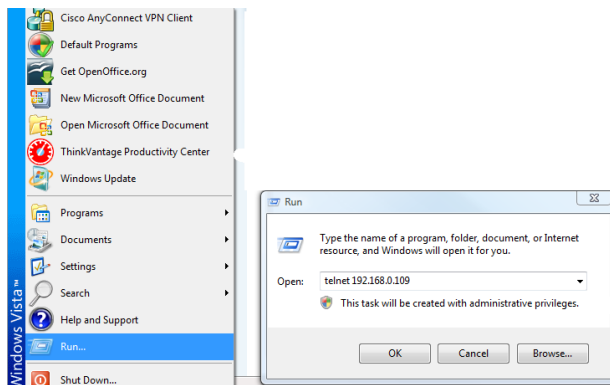


Figure 11 Run Windows Telnet Session

3. A command prompt will pop-up:

QNX Login:

Login: root Password: (there is no password)

Redhat Login:

Login: root Password: redhat

8.2 Enabling Telnet for Windows 7

NOTE: Windows 7 does not have **Telnet** enabled by default. You can enable Telnet by following these steps:

1. Start
2. Control Panel
3. Programs
4. Turn Windows features on or off
5. Check Telnet Client / Telnet Server
6. Hit OK

After that you can start Telnet via Command Prompt or Run.

If you want to access Telnet through Windows, you may need to activate it.

To install Telnet Client (Reference from <http://windows.microsoft.com/en-US/windows-vista/Telnet-frequently-asked-questions>)

1. Click the Start button, click Control Panel, click Programs, and then click Turn Windows features on or off. If you are prompted for an administrator password or confirmation, type the password or provide confirmation.
2. In the Windows Features dialog box, select the Telnet Client check box.
3. Click OK. The installation might take several minutes.

8.3 Putty.exe Telnet Session

In the case that Windows telnet session is not available, we recommend you to use putty.exe which you will find at this address: <http://www.chiark.greenend.org.uk/~sgtatham/putty/>

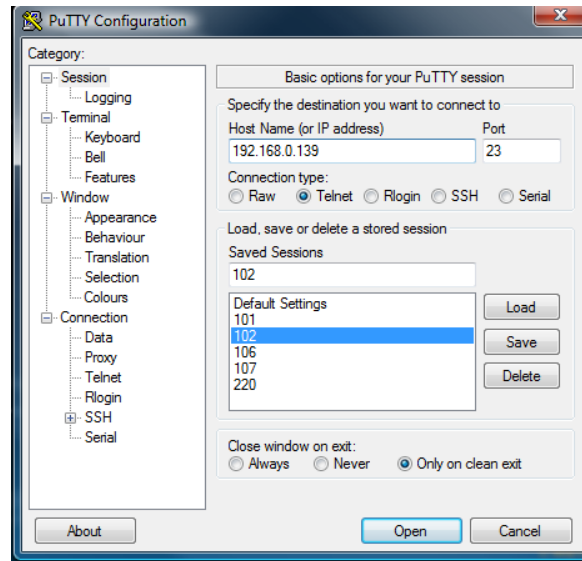
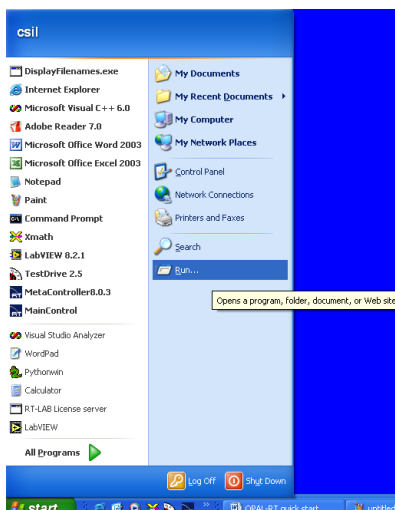


Figure 12 Usual configuration to set a telnet session with putty.exe

9 How to Ping Target from the Windows Start Menu:

1. Click Start Menu from the Desktop. Select "Run". For Win 7, Search for "Run" from Start Menu.





2. Enter: ping 192.168.10.101 (replace IP address with your Target Fixed IP).

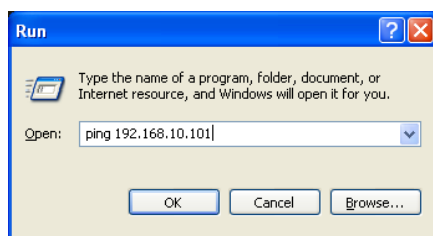
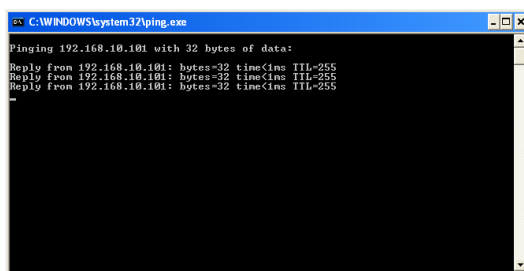


Figure 13 Run “Ping <Target IP address>”

4. This ping window shows the target properly responding to a Ping.



10 How to Set Fixed IP address in QNX Photon

10.1 Set Fixed IP address

1. As described in the previous section, connect a monitor, keyboard and mouse to the Opal-RT simulator. Then complete the following sequence:
2. Power UP Target computer to Boot QNX OS.
3. Type the following login for QNX.

```
Login: root
# ph
```

Note: typing “ph” in the QNX command line starts Photon, which is similar to Windows.

3. In Photon, go to the right toolbar
4. Configure> Network
5. Select **Devices**
6. Under en0:



Connection: Manual

IP: (enter IP address) (**example:** 192.168.0.101)

Netmask: 255.0.0.0

7. Click **Apply**

8. Click **Done**

9. Ping target IP address from Windows HOST PC:

Start>Run> ping XXX.XXX.XXX.XXX

10.2 Enabling the 2-ethernet ports in QNX

1. Follow the above Section 7.1 instructions to set the second Ethernet port.

2. Enable the second Ethernet port which you can find below in the same 'TCP/IP Configuration' window.

3. Reboot the target

Note: In case of the QNX RTOS, the host ID of both the Primary IP address and the secondary IP address should not be the same. For example if the Primary IP address is 192.168.0.xxx, the secondary IP address should be something like 192.168.40.xxx and it should not be something like 192.168.0.xxx.

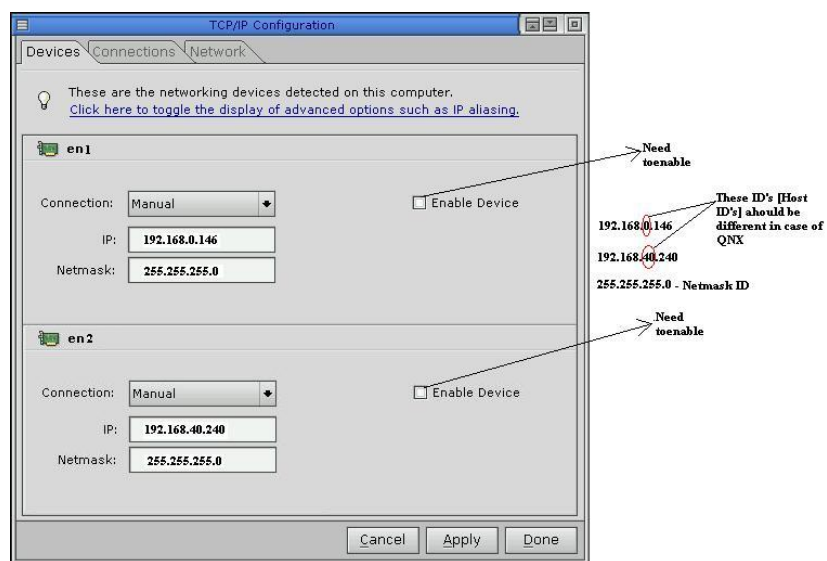


Figure 14 Photon TCP/IP Configuration for multiple Ethernet ports.

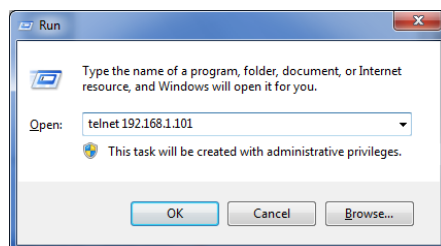


10.3 How to change IP address or IP mask on a QNX target through telnet

Note: it is easier to change IP address and IP mask in QNX photon as described above in Section 7.1.

1. Open a telnet session. This can be accomplished from the Windows Start Menu.

Note: In Win XP, select Run from Start Menu. In Win 7, search for "Run".



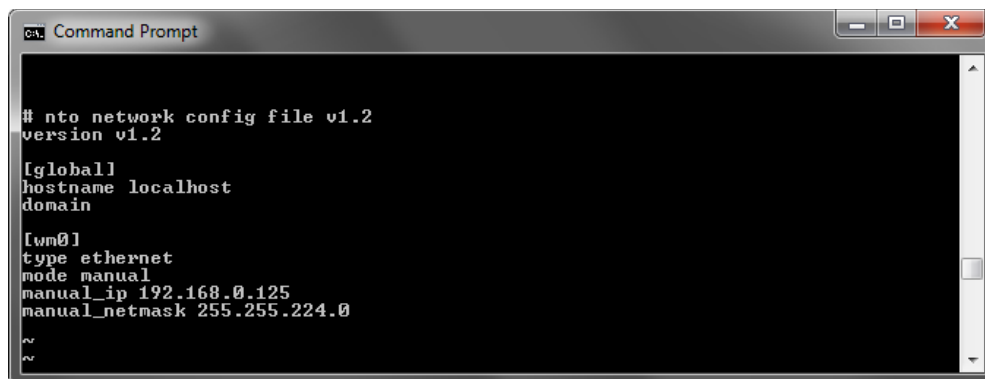
Warning: wrongly changing an IP address or mask may leave the target not connectable through telnet.

2. Type: "vi /etc/net.cfg "



3. Modify the IP address or IP mask

(Use arrow keys to move cursor, "xx" to delete, "i" to insert, "Esc" to change mode)



4. Press "Esc"
5. Then type ":wq " to save the file (or ":q " to leave the file without saving)
6. Then restart the target: Type: " shutdown -f " (this is a force shutdown instruction)



```
C:\> Command Prompt

~
~
~

wrote /etc/net.cfg, 13 lines, 168 chars
# shutdown -f
Shutting down apps...
```

11 How to configure IP address for RedHat Target

11.1 Set Fixed IP address

1. Under Linux, login as "root" with password "redhat".
2. Type "startx" command. This will open the RedHat GUI.
3. Click on System / Administration / Network. This will open the Network Configuration window.
4. Under Network Configuration, click New.
5. Select Ethernet Connection as the peripheral type and click Forward.
6. Select e1000e (eth0) as the Ethernet port to use and click Forward.
7. Check Static set IP address.
8. Under Address, set your own IP address (xxx.xxx.xxx.xxx)
9. Under Subnet Mask, set 255.255.255.0
10. Under Default Gateway Address: leave this field empty and then click on Forward / Apply.
11. On Network configuration window, select (eth0) which has just been configured and click on **Activate**.
12. Go to System / Log out root.
13. Reboot your system.

11.2 Enabling a second Ethernet port in RedHat

1. Follow the above Section 8.1 steps 4-11 to configure the secondary IP address.
2. Both addresses should have the same net mask ID.
3. Reboot the target.

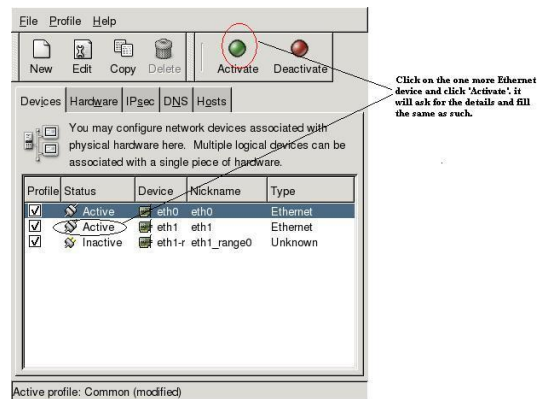


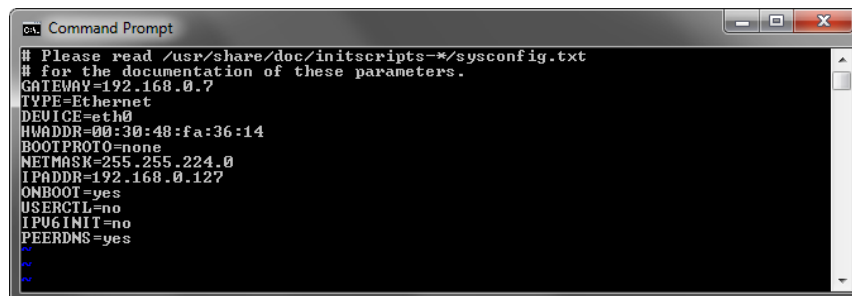
Figure 15 Redhat Linux TCP/IP Configuration for multiple Ethernet ports.

11.3 How to change IP address or IP mask on a RedHat target through telnet

Note: It is easier to change IP address and IP mask in RedHat GUI as described in Section 8.1.

Warning: A incorrectly changed IP or mask may leave the target not connectable through telnet.

1. Open a telnet session from the Windows XP/7 Host PC.
2. Type: "vi /etc/sysconfig/network-scripts/ifcfg-ethX ". Where X is a number (eg. eth0)



3. Modify the IP address (IP ADDR) or IP mask (NETMASK)
(Use arrow keys to move cursor, "xx" to delete, "i" to insert, "Esc" to change mode)

4. After the modification, Press "Esc ".
5. Then type ":wq " to save the file (or ":q " to leave the file without saving)
6. Then restart the target. Type: "/etc/init.d/network restart"

12 How to FTP QNX target from Host PC

12.1 METHOD 1:

1. Open New Explorer Window by either My Computer or Window button+E (shortcut)
2. Enter <ftp://ntuser:ntuser@XXX.XXX.X.XXX> for example: <ftp://192.168.0.101>
3. This is the ftp login assigned to your QNX or RedHat target:

login: ntuser

password: ntuser



Figure 16 FTP Login window

3. This will open the directory folder /usr/ntuser/ on your QNX or RedHat target.

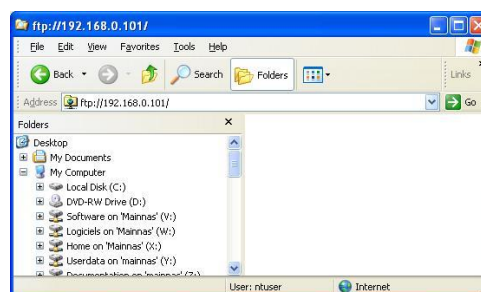
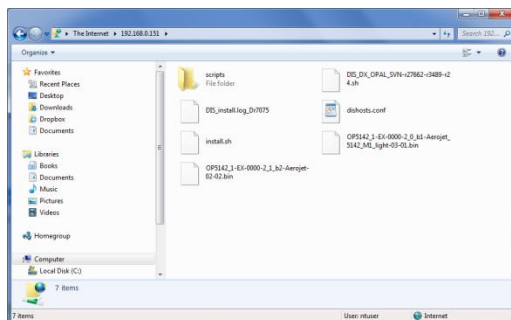


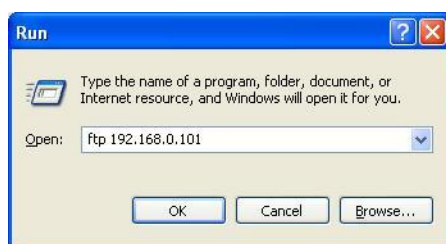
Figure 17 Windows Explorer Window for FTP Target folder

Note: Open an ftp connection on Redhat using <ftp://ntuser:ntuser@XXX.XXX.X.XXX> so you don't end up in the "public" folder.



12.2 METHOD 2:

1. From Start Menu > Run



2. Enter ftp <Target IP address>.
3. Login with ntuser user/password in [ftp.exe](#) command line.

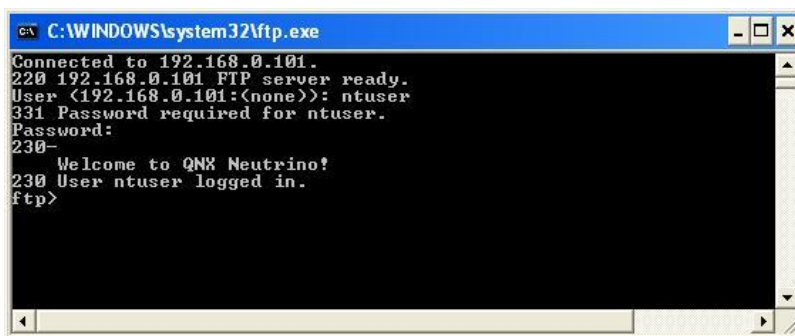


Figure 18 FTP Command Window

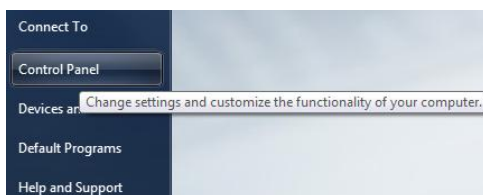
13 How to allow exceptions for Windows and Symantec Firewall

Note: Allowing RT-LAB Firewall exceptions should be completed after RT-LAB Software installation.

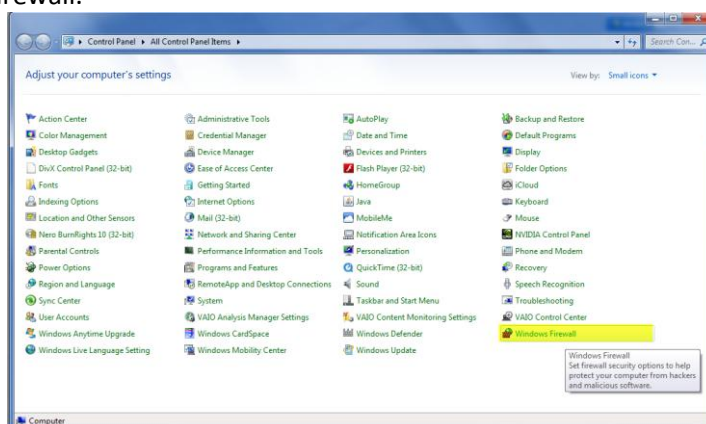
Windows Firewall and Symantec Firewall can either be disabled or exceptions can be allowed for RT-LAB programs. Firewall exceptions should be allowed for the RT-LAB MetaController and other RT-LAB applications for running on your HOST PC.

13.1 Windows Firewall with Windows 7

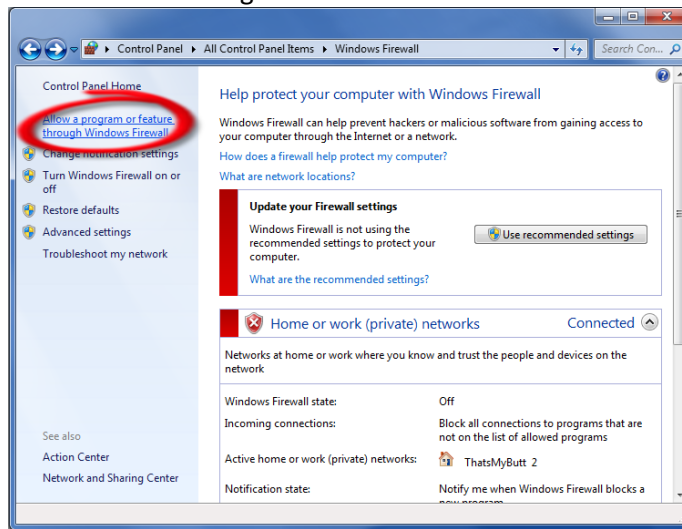
1. Start Menu > Control Panel.



2. Click on Windows Firewall.



3. Select "Allow a program or feature through Windows Firewall"



4. In the “Allowed Programs” Window, the user can see all the Programs that are allowed to communicate through the Windows Firewall.

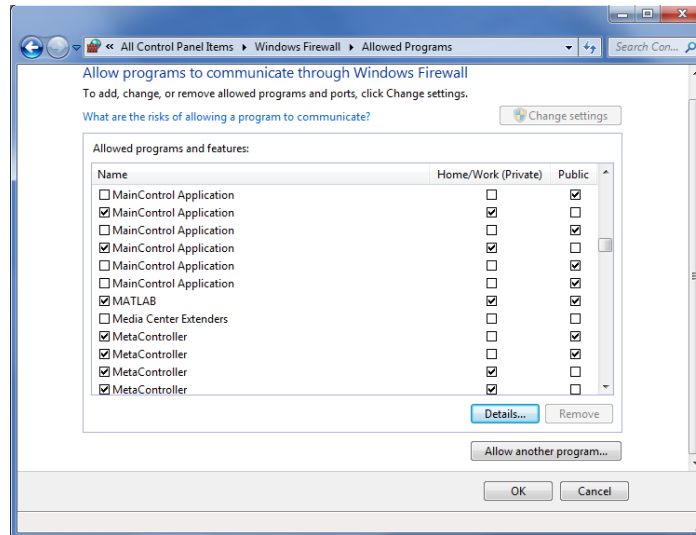
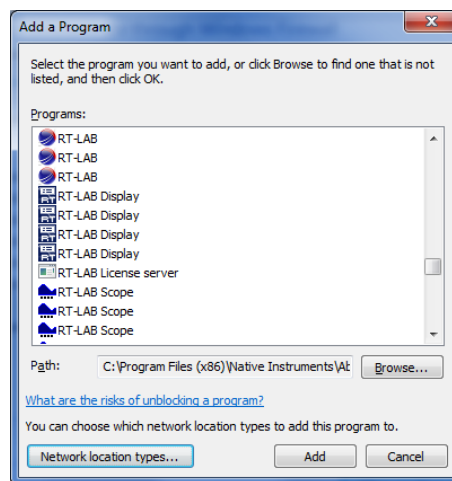


Figure 19 Windows 7 Firewall Allowed Programs

5. Verify that the following programs are allowed: RT-LAB 10: MetaController , Controller, RT-LAB, OpalDloader, PythonWin , TestDrive, Opal ProbeControl , and MATLAB
RT-LAB 8(additional): MainControl Application, ParameterControlPanel
6. To add additional programs, select “Allow another program”.

Note: When RT-LAB 10 has completed installation and started for the first time in Windows 7, Windows Firewall will pop-up to ask if the user wants to allow each of the RT-LAB programs through the Firewall.





13.2 Windows Firewall with Windows XP

1. Goto Control Panel > Windows Firewall > Select Allow Exceptions Tab

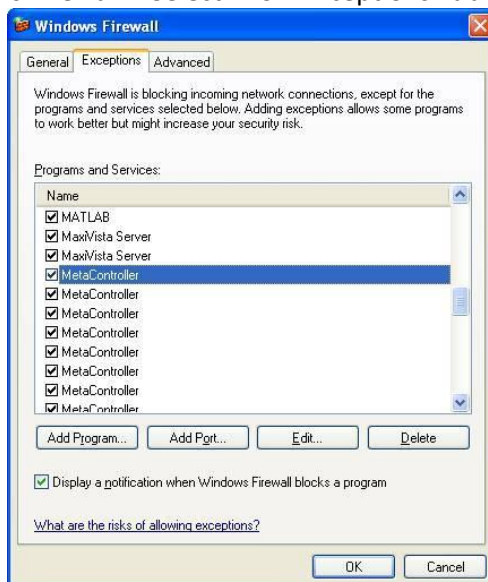


Figure 20 Windows XP Firewall Exceptions

2. Verify Allowed Exceptions for: MetaController , Controller, MainControl Application, PythonWin , TestDrive, ParameterControlPanel , Opal ProbeControl , and MATLAB.

13.3 Windows Firewall Allowed RT-LAB programs

It is necessary to Allow RT-LAB components through the firewalls of your host computer. It is recommended to bring down the Windows firewall and the other antivirus' firewalls. If impossible, the user must at least allow the following components:

- MetaController.exe
- Controller.exe
- RT-LAB.exe
- OpalDLoader.exe
- OpalD.exe
- ProbeControl.exe
- OpalParameterControl.exe (RT-LAB 8)

These are all found under C:\Opal-RT\RT-LAB10.x.x\common\bin. While running RT-LAB, if other components are required and Windows pop-ups appear to let them through, allow them to run.

RT-LAB 10:

MATLAB:	C:\Program Files\MATLAB\R201XX\bin\win32\MATLAB.exe
MetaController:	C:\OPAL-RT\RT-LAB10.X.X\Common\bin\MetaController.exe
ParameterControlPanel:	C:\OPAL-RT\RT-LAB10.X.X\Common\bin\OpalParameterControl.exe
PythonWin:	C:\Python2X\Lib\site-packages\pythonwin\Pythonwin.exe
ProbeControl:	C:\OPAL-RT\RT-LAB10.X.X\Common\bin\ProbeControl.exe



Controller: C:\OPAL-RT\RT-LAB10.X.X\Common\bin\Controller.exe

RT-LAB 8:

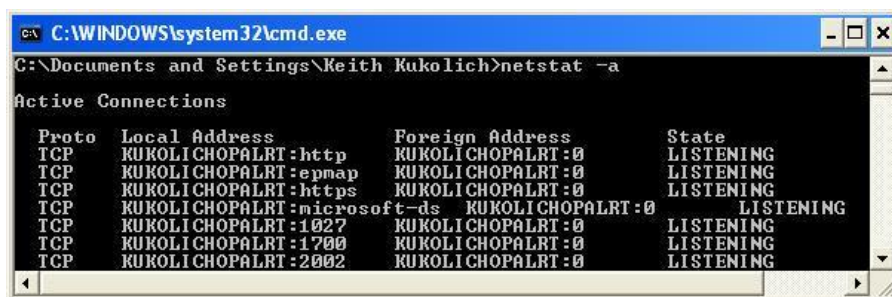
MainControl Application: C:\OPAL-RT\RT-LAB8.X.X\Common\bin>MainControl.exe

13.4 RT-LAB MetaController:

You can check if the Metacontroller is actually running:

In a command window: (Start -> run->cmd), type "netstat -a". You should see something on port 1700 and on port 2002. Then shut down the Metacontroller and type netstat -a again. Normally the port 2002 must disappear. If not, there must be some conflict with another program that uses port 2002.

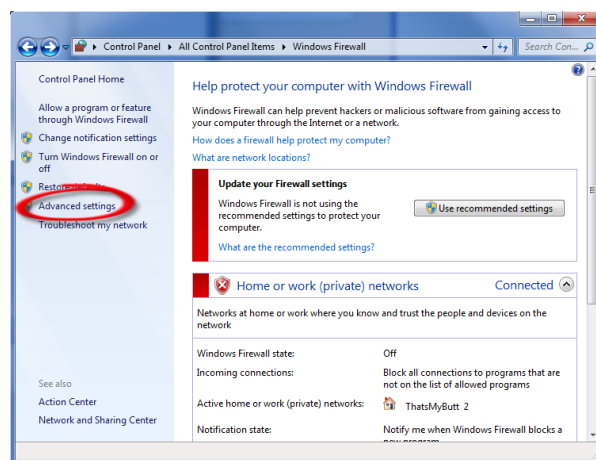
cmd window: netstat -a:



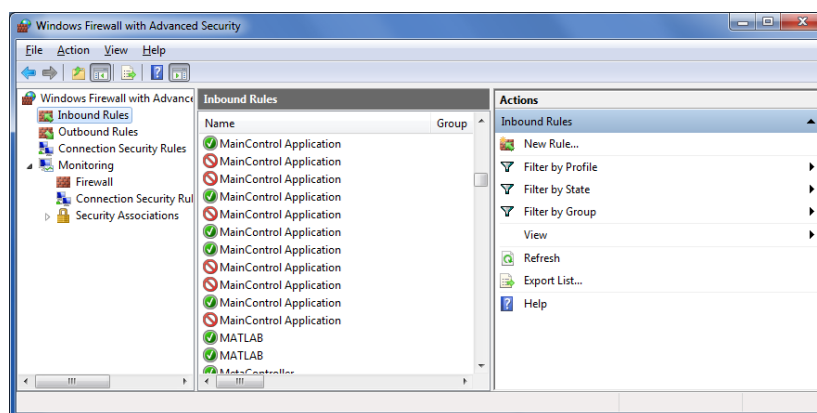
Note: If the MetaController Ports 1700 and 2002 are not shown from netstat command, then you add the ports to be allowed through Windows Firewall settings.

13.5 Windows 7: Add a TCP Port instructions

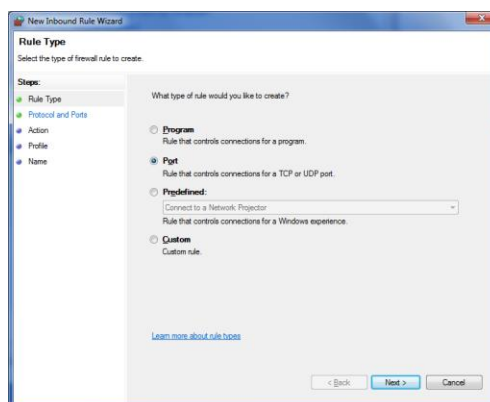
1. Select "Advanced Settings"



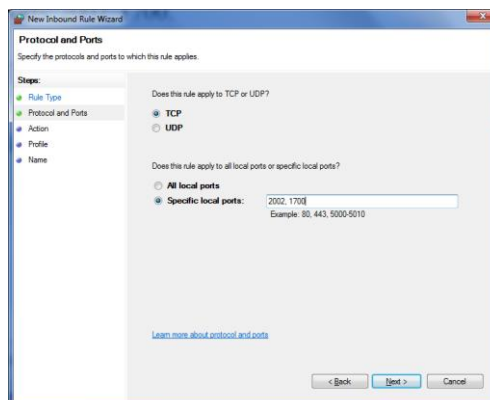
2. Select "Inbound Rules".



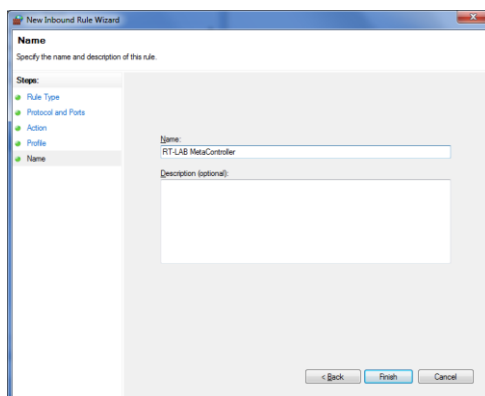
3. Select "Port". Click Next.



4. Select TCP and Specific Local ports: 2002, 1700.



5. Click next till you get to “Name” Step and assign name for Rule.



13.6 Window XP: Edit Windows Firewall Ports

1. From Windows Firewall Exceptions tab, Select “Add Port”.
2. Add the following ports to allow for the RT-LAB MetaController program.

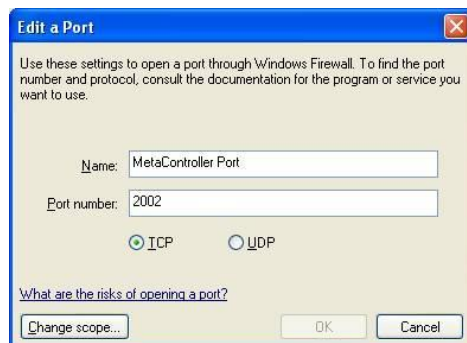


Figure 21 MetaController Firewall Port number:

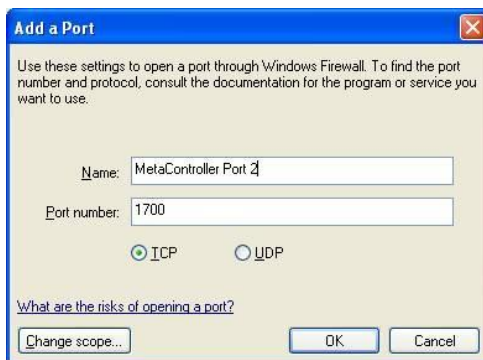


Figure 22 MetaController Firewall Port number 2:



14 Appendix

14.1 QNX Target Basic Commands

Below are QNX common commands and instructions for ftp and telnet.

QNX DEFAULT PASSWORDS:

Telnet LOGIN:

user: root

NO PASSWORD

FTP LOGIN:

User: ntuser

Password: ntuser

QNX Target Management Basic Commands

- **find** Searches the named directory and its sub-directories for files. Most frequently called like this: `find ./ -name "t*" -print` Which searches the current directory (and all of its sub-directories) for any files that begin with the letter "t" and then prints them out. If you are looking for a specific filename, then replace "t*" with "filename", and "find" will print out all incidences of this file.
- **ls {directory}** Shows directory listing. If no "directory" is specified, "ls" prints the names of the files in the current directory. The Command : `ls -lo /usr/opal-rt` gives you the versions of RT-LAB installed on your target
- **cp {filename(s)}{path}** Copies files from one directory/filename to another. "`cp f1 f2`" makes a file "f2" identical to "f1". "`cp *.c src/`" copies all files that end in ".c" into the "src" subdirectory.
- **rm filename(s)** Removes files. Careful with this one - it is irreversible. It is usually aliased (in a user's .cshrc file) to "`rm -i`" which insures that "rm" asks you if you are sure that you want to remove the named file.
- **mkdir dirname** Makes a sub-directory named "dirname" in the current directory.
- **pwd** Shows current working directory path.
- **mv** Moves files
- **uname -a** Tells you the QNX version of your target
- **pci -v | less** Tells you all the pci card in your target system
- **pidin info** Tells you information about your computer's memory and processor speed
- **chmod {options}** Changes the permission modes of a file. (i.e `chmod 777` allows for read write and execute permissions for all users)
- **vi**: Runs the screen oriented text editor named "vi". If a filename is specified, you will be editing that file. Type "[ESC]:q!" to exit without making any changes. You could check basic VI commands on http://www.la.unm.edu/computer/docs/basic_vi.shtml#modes
- **ifconfig -a** Gives your network setting information. If you want to change the IP address of your target, you need to edit the net.cfg file located in the ect directory
- **ps -a** shows all the current running processes on your QNX target
- **kill [process number]** allows you to end a process that is running on the QNX target (i.e. a model that is running)
- **shutdown -f** Reboots the QNX target



- **Shutdown -f -b** Shuts the down the QNX target, so you can turn off the power switch
ls -lo /usr/opalrt - which version of RT-LAB, RTE is running on the target

Based on <http://www.emba.uvm.edu/CF/basic.html#less>

14.2 'ipconfig' is not recognized as an internal or external command, operable program or batch file.

When trying to run ipconfig from a cmd window (dos prompt), I receive the following error. This applies for ipconfig, ping, telnet, etc.

14.2.1 ERROR MESSAGE:

'ipconfig' is not recognized as an internal or external command, operable program or batch file.

14.2.2 FIX:

1. Go to My Computer-> right click-> Properties->Advanced->Environment Variables->System variables and locate Path Environment Variable. Add C:\windows\system32;C:\windows\; at the end if it is not already there.
2. Be sure that the path for C:\windows\system32\ matches that on your computer C: drive.
3. Reopen cmd window and retry ipconfig, telnet, ping, etc.

14.3 My system is not pinging / booting

14.3.1 Description

When I try to ping the target from the host computer, I am getting "Request Timed Out" --> The system does not ping. It used to work just yesterday and I have not made any software upgrade on the host/target or any hardware changes. (This KB considers that the problem is hardware related: a part just does not work anymore). Feel free to contact support@opal-rt.com if you have any questions about some steps of the procedure.

14.3.2 Troubleshooting

After each of the following step, check to see if the target pings:



A1: Make sure the Ethernet cable is properly connected at both ends or that your router/switch is properly running. Reboot the target.

A2: Try with another Ethernet cable.

A3: On your host, in the Network Connections > Disable and Re-Enable the Local Area Connection and put a different IP. (remember the first three numbers must match the target's 192.168.0.xxx)

A4: Disconnect all loopbacks and various cables connected to the Target, just keep the Ethernet cable and the power cables connected.

Conclusion: The problem is within the target itself, not with any external hardware or components.

Action: Check if the target boots at all...

Warning: You should wear an anti-static wristband for the following steps:

B1: Connect a keyboard and a monitor to the target. Make sure nothing else is connected except power cables. Boot the target and see if you get anything on the monitor. I get something (text), QNX seems to crash during load --> Go to F1. I get a black screen --> Continue to B2.

B2: Reboot and try to press keys to enter the BIOS. Classic keys are Enter, Delete, F2, F10, F12 or the arrow keys. I am able to access the BIOS --> Go to F2. I am not able to access the BIOS --> Continue here.

Conclusion: The problem is hardware related, most commonly the PCI cards, the power supply, the motherboard or the hard drive.

Action: Let's test those components one by one.

C1: Turn off the power switch at the back of the HIL/Wanda before removing/adding anything. You can always disconnect the power cables if you want.

C2: Remove all PCI cards that are located in 32-bit or 64-bit PCI. See attached document to know more about what are PCI slots. Make sure you always keep the video card inserted in its slot. Try to boot.

C3: Remove all RAM bars **but one**. See attached document to know more about RAM slots. Make sure you always keep at least one RAM bar inserted. Try to boot.

C4: If you happen to have another video card, remove the one that is currently in the target and put the new one. Make sure you plug the monitor to the video card! Try to boot.

Conclusion: Cards are not responsible for the problem. If they are, find which one causes the target not to boot and contact support@opal-rt.com about it.

Action: Keep the removed cards/RAM bars aside and troubleshoot the power supply.



D1: First, when you try to boot, are the fans on the motherboard running. Are the LEDs glowing?

D2: Turn off the power switch at the back of the HIL/Wanda before removing/adding anything. You can always disconnect the power cables if you want.

D3: There is one large connector coming from the power supply to the motherboard. This connector is located near the power supply and has 20 or 24 pins. Proceed with this procedure. The table right before step 2.3 is good if you have a 20-pin cable. If the power supply runs, there will be a little breeze coming from its fan. It is quite silent.

Conclusion: Power supply is working well. If not, detail your test to support@opal-rt.com

Action: Reconnect the power supply to the motherboard and troubleshoot the hard drive.

E1: Turn off the power switch at the back of the HIL/Wanda before removing/adding anything. You can always disconnect the power cables if you want.

E2: If you have another hard drive, try it on this target. You can also try the potentially failing hard drive on a target that works if you have another one.

E3: Does the hard drive runs? If so, it should vibrate a little bit. If not, make sure all cables are properly connected to it. You can also disconnect the power cable and probe the pins. Black wires are GND. Red wire is +5V, yellow one is +12V. If the power is not coming, try to use another power cable from the power supply if available.

Conclusion: Hard drive is properly powered and running. The motherboard is potentially faulty. Contact support@opal-rt.com about it.

F1: Take note of the error message that appeared during QNX boot and send it to support@opal-rt.com. You can also take a picture/screenshot of the monitor so we can see what is the complete error and where it crashed during boot. Please provide all the information requested (project number, software versions, etc) and make sure to detail what steps you have done of this procedure (A1,B2,etc).

F2: Contact support@opal-rt.com and mentions what happens after you leave the BIOS (select Save+Exit). Please provide all the information requested (project number, software versions, etc) and make sure to detail what steps you have done of this procedure (A1,B2,etc).



14.4 RT-LAB

RT-LAB provides tools for running simulations of highly complex models on a network of distributed run-time targets, communicating via ultra low-latency technologies, in order to achieve the required performance. In addition, RT-LAB's modular design enables the delivery of economical systems by supplying only the modules needed for the application in order to minimize computational requirements and meet customer's price targets. This is essential for high-volume embedded applications.



How it Works

RT-LAB allows the user to readily convert Simulink models, via Real-Time Workshop (RTW), and then to conduct Real-Time Simulation of those models executed on multiple target computers equipped with multi-core PC processors. This is used particularly for Hardware-in-the-Loop (HIL) and rapid control prototyping applications. RT-LAB transparently handles synchronization, user interaction, real-world interfacing using I/O boards and data exchanges for seamless distributed execution.

Single Target Configuration

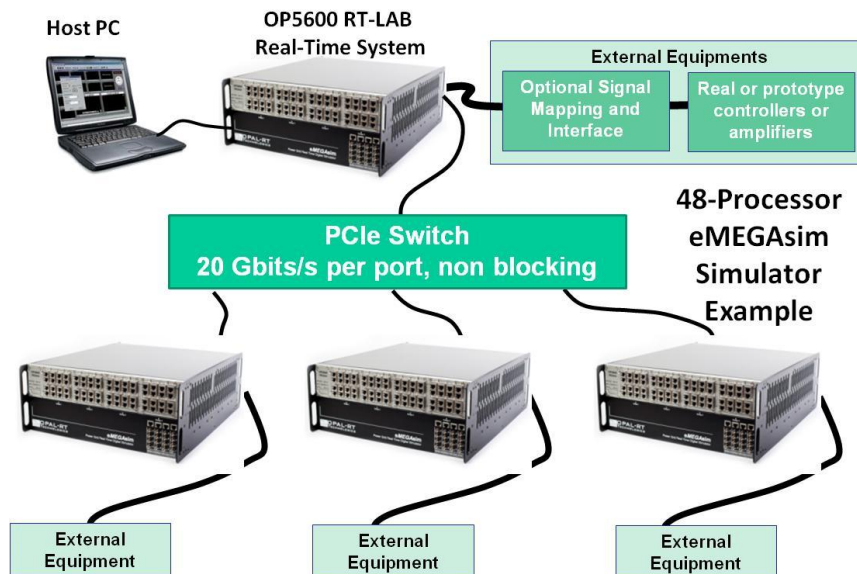
In this configuration, typically used for rapid control prototyping, a single computer runs the plant simulation or control logic. One or more hosts may connect to the target via an Ethernet link. The target uses QNX or Linux as the RTOS for fast simulation or for applications where real-time performance is required. RT-LAB used Red Hat RTOS which is the standard Red Hat distribution package with an optimized set of parameters to reach real-time performance enabling to reach model time step as low as 10 micros on multi-core processors.

Distributed Target Configuration

The distributed configuration allows for complex models to be distributed over a cluster of multi-core PCs running in parallel. The target nodes in the cluster communicate between each other with low latency protocols such as FireWire, SignalWire or InfiniBand, fast enough to provide reliable communication for real-time applications. The real-time cluster is linked to one or more host stations



through a TCP/IP network. Here again, the cluster of PCs can be used for Real-Time applications (using QNX or RedHat Linux), or fast simulation of complex systems (using QNX, RedHat or Windows). RT-LAB PC-cluster targets are designed for flexible and reconfigurable mega-simulation. The user can build and expand the PC-cluster as needed, then redeploy the PCs for other applications when the simulation is done. RT-LAB can accommodate up to 64 nodes running in parallel.



About Opal-RT Technologies Inc.

Opal-RT Technologies (www.opal-rt.com) is the leading developer of open PC-Based Real-Time Digital Simulators and Hardware-in-the-Loop testing systems for avionic, electrical, power electronic and electro-mechanical systems.

All Opal-RT Simulator products are built using commercial-off-the-shelf PC hardware and leverage the power of RT-LAB – Opal-RT's flagship Real-Time Simulation technology that has revolutionized the way model-based design is performed. RT-LAB's flexibility and scalability allow it to be used in virtually any simulation or control system application, and to add computing power to simulations where and when it is needed.

In addition, all Opal-RT Simulators are fully integrated with MATLAB/Simulink from The MathWorks Inc.