Freescale Semiconductor
Application Note

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PPPoE Setup and Testing on the M5249C3 Evaluation Board

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This application note describes the setup of PPPoE on the M5249EVB under the uClinux environment. The setup procedure, uClinux configuration required, and the testing results are included. This application note assumes the reader is familiar with running uClinux on a ColdFire evaluation board (EVB). Therefore, the procedures for compiling uClinux and download to the EVB are not included. The EVB used in this application note is the M5249EVB. However, the procedure described can be similarly applied to other ColdFire EVBs.

1 PPPoE Testing

There are two parts in the testing. The first part is to connect the PPPoE client under testing to a Windows 2000 based PC. The PPPoE incoming call function of Windows 2000 was enabled. A Windows PC was used for testing, since the PC-based PPPoE server can help to confirm at the server side that the PPPoE connection is established in the testing.

After the successful testing with the PC-based PPPoE server, the second part of the testing is done with an existing commercial ISP.

1.1 Testing Using PC (Windows 2000) as PPPoE Server

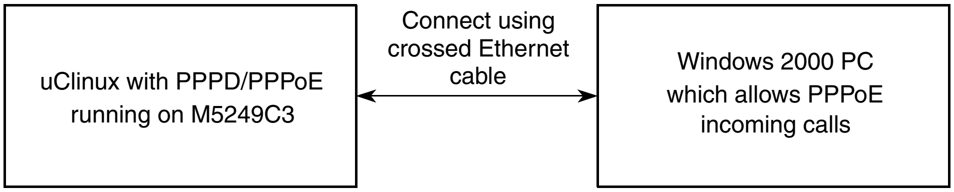

uClinux with PPPD/PPPoE running on M5249C3
Connect using crossed Ethernet cable
Windows 2000 PC which allows PPPoE incoming calls

Figure 1. Testing Setup Block Diagram

Testing Procedure:

1. Download the uClinux source code. The source code distribution used in this testing is uClinux-dist-20040408[1], available at: http://www.uclinux.org/pub/uClinux/dist/uClinux-dist-20040408.tar.gz
2. After decompressing the source code (`tar -zxvf uClinux-dist-20040408.tar.gz`), configure the uClinux (`make xconfig`):
   a) Select M5249C3 platform
   b) Select uClinux 2.4.x and uClib[2]
   c) In ‘Kernel Configuration’ => ‘Network Device Support’,
      i) Enable ‘PPP support’ and ‘PPP support for async serial port’
      ii) Disable ‘SLIP (serial) support’[3]
   d) In ‘Application Configuration’ => ‘Network’ application,
      i) Enable ‘rp-pppoe’[4]
3. Modify the source code in file ‘uClinux/user/pppd/pppd/lcp.c’[5]
   Line 1459: change to `orc = CONFNAK`
4. Then use the commands ‘`make dep`’ and ‘`make`’ to build the image file[6].
5. Create a ‘ppp’ directory in uClinux/romfs/etc. Then create a password file ‘pap-secrets’ (example shown in Appendix A) in uClinux/romfs/etc./ppp and enter the login username and password in it. The username and password should be the same as used in the PPPoE incoming call setup in the Windows 2000 at the PC side.
6. Execute ‘`make`’ again to include the pap-secrets file into the image file.
7. Download the uClinux image file to the M5249C3 board and execute command ‘`g 20000`’ to start running the uClinux. Then the PPPoE client side is ready for testing.
8. Setup the Windows 2000 for PPPoE testing. The detailed setup procedure can be found in Appendix B.
9. Connect the M5249C3 board and the PC using a cross Ethernet cable.
10. Execute the following command at the uClinux console:

```
/bin/pppd pty ‘/bin/pppoe –I eth0 –D /var/pppoe.log’ user test &
```
[7]

(‘test’ is the user name used in the testing)

[1] Other uClinux distributions were not tested and may not work using the same testing procedure.
[2] There will be a source code compilation error if uClinux 2.6 or other library are used.
[3] It was found that PPPoE did not work if SLIP is not disabled.
[4] rp-pppoe was used because there is problem in uClinux kernel mode PPPoE.
[5] Change ‘rejecting’ to ‘No Ack’ the unsupported authentication request.
[6] The tool chain used in testing is m68k-elf-20030314.

11. The connection status can be checked via the following methods:
    a) At uClinux side:

    i) Execute the command ‘`ps -A`’. The console display will show that pppd and pppoe are running.

    ii) Execute the command ‘`ifconfig`’. The console display will show the PPP0 connection status.

    b) At PC side:

    i) Open the properties of ‘My Network places’ and check the username can be found in the properties list.

    ii) The connection icon will be shown at the taskbar if the ‘Show icon on taskbar when connected’ function is enabled.

Testing Results:

1. When the command ‘`ps -A`’ is executed at the uClinux console, processes ‘pppd’ and ‘pppoe’ will be shown. This indicates that the pppd and pppoe processes are running normally.

```
/bin> ps -A

PID PORT STAT   SIZE SHARED %CPU COMMAND

 1       S      37K     0K  1.4 /bin/init

 2       S       0K     0K  0.0 keventd

 3       R       0K     0K  0.0 ksoftirqd_CPU0

 4       S       0K     0K  0.0 kswapd

 5       S       0K     0K  0.0 bdflush

 6       S       0K     0K  0.0 kupdated

 13      S      21K     0K  0.2 dhcpcd -p -a eth0

 14  S0  R      28K     0K  0.2 /bin/sh

 15      S      14K     0K  0.1 /bin/inetd

 16      S      42K     0K  0.1 /bin/boa

 17  S0  S      70K     0K  1.5 pppd pty /bin/pppoe -I eth0 -D /var/pppoe.lt

 18  S0  S      22K     0K  4.1 /bin/pppoe -I eth0 -D /var/pppoe.log
```

2. When the command ‘`ifconfig`’ is executed at the uClinux console, the interface ‘ppp0’ will be shown. This indicates that the PPPoE connection is established.

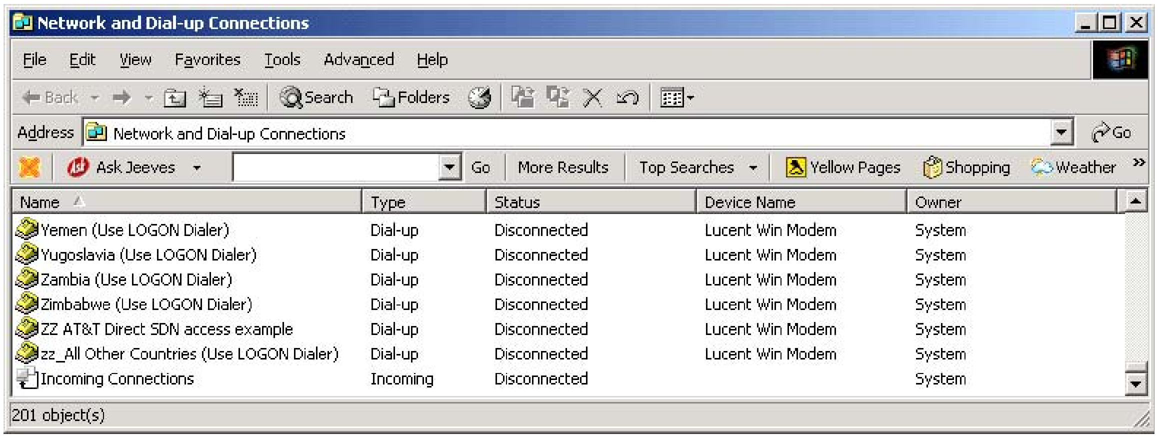
```
/bin> ifconfig

eth0      Link encap:Ethernet  HWaddr 00:CF:52:49:C3:01

          UP BROADCAST NOTRAILERS RUNNING  MTU:1500  Metric:1
```

[7] The parameter ‘–I eth0’ is optional in this testing because the default Ethernet port used is eth0 if there is no –I parameter. The parameter ‘–D /var/pppoe.log’ is for logging the PPPoE connection debug information in file pppoe.log. This parameter can be omitted if the debug information is not needed during testing. So the command for the PPPoE testing can be as simple as:
/bin/pppd pty ‘/bin/pppoe’ user test &

```
          RX packets:166 errors:0 dropped:0 overruns:0 frame:0
          TX packets:113 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          Interrupt:166 Base address:0x300
lo        Link encap:Local Loopback
          inet addr:127.0.0.1  Mask:255.0.0.0
          UP LOOPBACK RUNNING  MTU:16436  Metric:1
          RX packets:0 errors:0 dropped:0 overruns:0 frame:0
          TX packets:0 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:0
ppp0      Link encap:Point-to-Point Protocol
          inet addr:169.254.198.76 P-t-P:169.254.173.152  Mask:255.255.255.255
          UP POINTOPOINT RUNNING NOARP MULTICAST  MTU:1500  Metric:1
          RX packets:54 errors:0 dropped:0 overruns:0 frame:0
          TX packets:9 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:3
```

3. The ‘properties’ of ‘My Network Place’:

   Before making the PPPoE connection, the PPPoE call connection is shown as ‘Incoming Connections’ and the status is ‘Disconnected’.



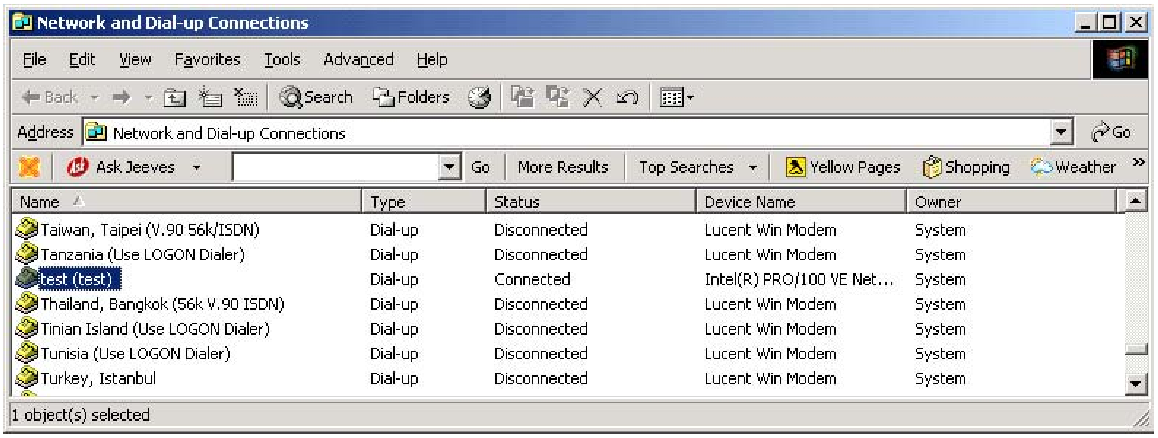
Address: Network and Dial-up Connections

Name	Type	Status	Device Name	Owner
Yemen (Use LOGON Dialer)	Dial-up	Disconnected	Lucent Win Modem	System
Yugoslavia (Use LOGON Dialer)	Dial-up	Disconnected	Lucent Win Modem	System
Zambia (Use LOGON Dialer)	Dial-up	Disconnected	Lucent Win Modem	System
Zimbabwe (Use LOGON Dialer)	Dial-up	Disconnected	Lucent Win Modem	System
ZZ AT&T Direct SDN access example	Dial-up	Disconnected	Lucent Win Modem	System
zz_All Other Countries (Use LOGON Dialer)	Dial-up	Disconnected	Lucent Win Modem	System
Incoming Connections	Incoming	Disconnected		System

201 object(s)

Figure 2. Network Connections Window Prior to PPoE Connection

After making the PPPoE connection, the ‘Incoming Connection’ will change to connected username (‘test’ is used in this example). Status is ‘Connected’.

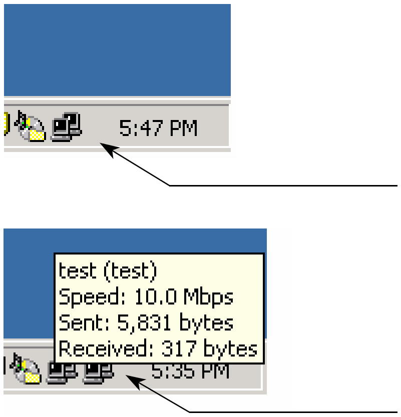

Network and Dial-up Connections
File Edit View Favorites Tools Advanced Help
Back Search Folders
Address Network and Dial-up Connections
Go
Ask Jeeves
Go More Results Top Searches Yellow Pages Shopping Weather

Name	Type	Status	Device Name	Owner
Taiwan, Taipei (V.90 56k/ISDN)	Dial-up	Disconnected	Lucent Win Modem	System
Tanzania (Use LOGON Dialer)	Dial-up	Disconnected	Lucent Win Modem	System
test (test)	Dial-up	Connected	Intel(R) PRO/100 VE Net...	System
Thailand, Bangkok (56k V.90 ISDN)	Dial-up	Disconnected	Lucent Win Modem	System
Tinian Island (Use LOGON Dialer)	Dial-up	Disconnected	Lucent Win Modem	System
Tunisia (Use LOGON Dialer)	Dial-up	Disconnected	Lucent Win Modem	System
Turkey, Istanbul	Dial-up	Disconnected	Lucent Win Modem	System

1 object(s) selected

Figure 3. Network Connections Window After PPoE Connection

4. The icon in the system tray.



test (test)
Speed: 10.0 Mbps
Sent: 5,831 bytes
Received: 317 bytes

Before the PPPoE connection, only the Ethernet cable connection icon is shown at the taskbar

After making the PPPoE connection, second icon will be shown at the taskbar.

Figure 4. Taskbar Icon

1.2 Testing Using ISP Connection (HGC Broadband)

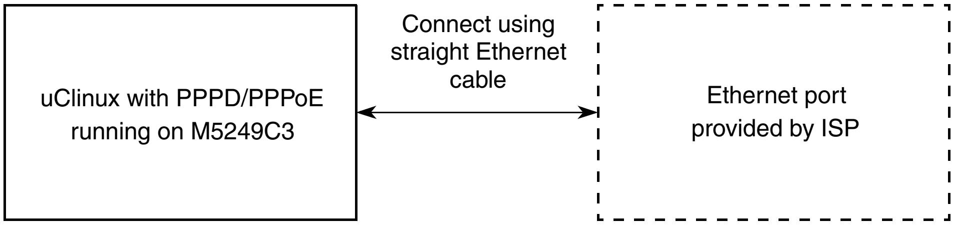

uClinux with PPPD/PPPoE running on M5249C3
Connect using straight Ethernet cable
Ethernet port provided by ISP

Figure 5. Testing Setup Block Diagram

The ISP test setup is very similar to the test using a PC, except that the M5249C3 board is connected to the Ethernet port provided by the ISP (not PC) using a straight Ethernet cable (not cross Ethernet cable).

Testing Procedure:

1. The setup of the PPPoE client side is the same as that of the PPPoE testing procedure using PC. (Testing procedure step 1 to 7 in Section 1.1, “Testing Using PC (Windows 2000) as PPPoE Server’). Use the username and password of the ISP account in the ‘pap-secrets’ file in step 4 of the PC test.
2. For some ISPs, a file ‘resolve.conf’ at /etc is needed for the connection. This file contains the IP address of the DNS. Create this file using the same procedure as the pap-secrets file. (resolve.conf used in this example is shown in Appendix C)
3. Connect the M5249C3 board and the ISP Ethernet port using a straight Ethernet cable.
4. Execute the following command at the uClinux console:

   ```
   /bin/pppd pty ‘/bin/pppoe’  user test &
   ```
5. The connection status can be checked by:

   At uClinux side:

   i) Execute the command ‘`ps -A`’. The console display will show that pppd and pppoe is running

   ii) Execute the command ‘`ifconfig`’. The console display will show the PPP0 connection status.

Testing Results:

1. When the command ‘`ps -A`’ is executed at the uClinux console

```
/> ps -A
  PID PORT STAT  SIZE SHARED %CPU COMMAND
    1      S      37K     0K  0.3 /bin/init
    2      S       0K     0K  0.0 keventd
    3      R       0K     0K  0.0 ksoftirqd_CPU0
    4      S       0K     0K  0.0 kswapd
    5      S       0K     0K  0.0 bdflush
    6      S       0K     0K  0.0 kupdated
   13      S      23K     0K  0.0 dhcpcd -p -a eth0
   14   S0 R      36K     0K  0.0 /bin/sh
   15      S      14K     0K  0.0 /bin/inetd
   16      S      42K     0K  0.0 /bin/boa
   18      S      70K     0K  0.1 /bin/pppd pty /bin/pppoe user auhk@hgcbroadband.com
   19      S      21K     0K  0.1 /bin/pppoe
```

2. When the command ‘`ifconfig`’ is executed at the uClinux console

```
/> ifconfig
eth0      Link encap:Ethernet  HWaddr 00:CF:52:49:C3:01
          inet addr:10.120.92.28  Bcast:10.120.92.255  Mask:255.255.255.0
```

```
          UP BROADCAST NOTRAILERS RUNNING  MTU:1500  Metric:1
          RX packets:26 errors:0 dropped:0 overruns:0 frame:0
          TX packets:56 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          Interrupt:166 Base address:0x300
lo        Link encap:Local Loopback
          inet addr:127.0.0.1  Mask:255.0.0.0
          UP LOOPBACK RUNNING  MTU:16436  Metric:1
          RX packets:0 errors:0 dropped:0 overruns:0 frame:0
          TX packets:0 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:0
ppp0      Link encap:Point-to-Point Protocol
          inet addr:221.126.255.143  P-t-P:221.126.252.1  Mask:255.255.255.255
          UP POINTOPOINT RUNNING NOARP MULTICAST  MTU:1492  Metric:1
          RX packets:9 errors:0 dropped:0 overruns:0 frame:0
          TX packets:4 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:3
```

2 Conclusion

The PPPoE connection using uClinux at the client side was tested in this application note. The testing results showed that a PPPoE connection in a uClinux distribution 20040408 environment can be established with an external ISP and a Windows 2000 PPPoE server.

The uClinux configuration needed for working PPPoE was also determined in this testing. Please refer to the testing procedure in Section 1.1, “Testing Using PC (Windows 2000) as PPPoE Server,’ for the configuration.

In order to avoid introducing unnecessary problems to the test, the command used for invoking pppd and pppoe was kept as simple as possible. Only a few necessary optional parameters were included in the command. However, there are many optional parameters for executing pppd and pppoe. Please refer to the manual page of pppd and pppoe for more details on these parameters. More parameters may be required for further testing and real application.

It was found that pppd source code (lcp.c) modification was also needed to make the PPPoE working. Please refer to the testing procedure in Section 1.1, “Testing Using PC (Windows 2000) as PPPoE Server,’ for the modification details.

In summary, uClinux distribution, uClinux configuration, invoke command, and source code modification are needed to make the PPPoE connection work.

Appendix A

pap-secrets file:

```
# Secrets for authentication using PAP
# clientserver  secret                  IP addresses
“test”  *       “password”
```

Appendix B

Setup procedure for Windows 2000 for PPPoE:

- If the PC is running Windows 2000, right-click the **My Network Places** icon on the desktop and select **Properties** to start the **Network and Dial-up Connections** window.
- If the PC is running Windows XP, click the **Start** button, select **Control Panel**, then click **Network and Internet Connections** and then click the **Network Connections** control panel icon to start the **Network Connections** window.
- Double-click **Make New Connection** and click **Next**.
- Select **Setup an advanced connection** and click **Next**.
- Select **Accept incoming connections** and click **Next**.
- The list of **Connection devices** should contain the names of the network adapters in your system. Check all network adapters through which you want to accept incoming connections and click **Next**.
- Choose whether you want to allow **Virtual private connections** and click **Next**.
- Select the user accounts which should be allowed to connect to your machine and click **Next**.
- Select the networking components you want to enable for the incoming connections. Note that **PPP over Ethernet Protocol** will also be shown in this list, but its checkbox will be grayed out.
- If you enable the **Internet Protocol (TCP/IP)** for incoming connections, you may also want to click on the **Properties** button to define the **IP addresses** to use for the incoming connections.
- Click **Next** and then click **Finish** to finish the wizard and enable the server. The **Network and Dial-up Connections** window will now contain an additional item named **Incoming Connections**.
- If you want to disable the server only for a specific network adapter, right-click the **Incoming Connections** item, select **Properties**, **clear** the checkbox next to the name of that network adapter and click **OK** to stop the protocol from offering services on that network adapter.
- If you want to disable accepting **any** connection on your machine (not only through this protocol, but through **all** dial-up devices installed on your machine), right-click the **Incoming Connections** item, select **Delete** and confirm to stop the protocol from offering any services.

For further help on using **Incoming Connections**, please refer to the operating system's documentation on this topic.

Appendix C

resolve.conf file:

```
; generated by /sbin/dhclient-script

search pppoe.dialer

nameserver 210.0.128.242
```

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