



Application Note 34

Configuring ADSL to backup to PSTN/ISDN with automatic testing and recovery back to ADSL.

UK Support
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1 INTRODUCTION

1.1 Outline

The document describes how to configure a Digi Transport router to fail over to PSTN when there is a problem with the main ADSL connection. Once the ADSL connection is working again the router will test it by sending pings and then revert back to ADSL and drop the PSTN connection.

This application note uses PPP 4 (PSTN) as the failover interface, however, if the router being configured has ISDN, simply configure PPP 2 (ISDN) instead of PPP 4. The same configuration can be applied to the ISDN interface.

For failover from ADSL to a cellular network, please see Application Note 34a as the configuration is slightly different.

1.2 Assumptions

This guide has been written for use by technically competent personnel with a good understanding of the communications technologies used in the product, and of the requirements for their specific application.

Configuration: This application note assumes that the router will be connecting to a cellular network.

This application note applies to;

Models shown: Digi Transport DR64 router with ADSL & PSTN running firmware version 5081.

Other Compatible Models: All Digi Transport products.

Firmware versions: 4905 or later.

Configuration: This Application Note assumes that the Digi Transport router is already configured with a working ADSL connection through PPP 1.

1.3 Corrections

Requests for corrections or amendments to this application note are welcome and should be addressed to: uksupport@digicom.com

Requests for new application notes can be sent to the same address.

1.4 Version

Version Number	Status
1.0	Published
1.1	Re-branded to Digi Transport

2 CONFIGURATION

2.1 Configure PPP 1 (ADSL)

This PPP interface should already be configured for use with the ISP. You should confirm that you have a working ADSL connection before proceeding with this configuration.

The PPP 1 interface needs to be configured to be “always on”.

The inactivity timer should be set to 0.

Configuration - Interfaces > PPP > PPP 0 - 4 > PPP 1 > Standard

Parameter	Setting	Description
Always on mode	ON	Configures interface as always on
Inactivity timeout (s):	0	Interface is always connected and active

Use GPRS/PSTN/external modem: No

Detach GPRS on link failure: No

Detach GPRS between connection attempts: No

Username: user@isp.com

Password (Assigned): *****

Confirm password: *****

AODI NUA:

Always on mode: On

AODI delay (s): 0

Power up AODI delay (s): 0

Go out of service if first AODI connections fail: No

DNS server:

Multi-link: Off

Inactivity timeout (s): 0

Inactivity timeout #2 (s): 0

RX packet Inactivity timeout (s): 0

Click OK

PPP 1 should be configured to generate ICMP requests that the firewall can monitor and use to detect when the ADSL connection has a problem.

It is also necessary to configure a settling time on the interface. The settling time is a parameter that prevents the Digi Transport from using the interface until it has been up for the specified number of seconds. This delay is required so that any ICMP echo requests (used for testing the interface) are not sent so soon after the interface has come up that the ISP drops the reply packet. (ISP routing tables are often not updated within the first few seconds of an interface coming up. Sending packets immediately often causes the reply to these packets to be dropped.)

Configuration - Interfaces > PPP > PPP 0 - 4 > PPP 1 > Advanced

Parameter	Setting	Description
Ping request interval	10	Send ICMP requests every x seconds
Only send PINGs when interface is in service	YES	Do not send ICMP requests if using cellular
PING IP address	1.2.3.4	A public IP address that you can ping to check connectivity via ADSL
Settling time (*100ms)	100	Do not send 1 st ping until 10 seconds after interface has come up

LCP echo request interval (s):	<input type="text" value="0"/>
Reset link after this many failed LCP echo requests:	<input type="text" value="0"/>
PING request interval (s):	<input type="text" value="10"/>
No PING response request interval (s):	<input type="text" value="0"/>
PING response timeout (s):	<input type="text" value="0"/>
New connections to resume with previous PING interval:	<input type="text" value="No"/>
Only send PINGs when interface is in service:	<input type="text" value="Yes"/>
PING IP address:	<input type="text" value="1.2.3.4"/>
No PING response reset delay (s):	<input type="text" value="0"/>
Use ETH 0 for PING source IP:	<input type="text" value="No"/>
Settling time (*100ms):	<input type="text" value="100"/>
Heartbeat interval (s):	<input type="text" value="0"/>
Heartbeat destination:	<input type="text"/>

Click OK

2.2 Configure PPP 4 (PSTN)

It will be necessary to configure PPP 4 as an outbound interface as the default is for the interface to accept incoming calls. Then ISP configuration will be added.

Navigate to the following location:

Configuration - Interfaces > PPP > PPP 0 - 4 > PPP 4 > Standard

Scroll to the bottom of the page and click "Load dialling defaults".

The PPP 4 configuration needs to be configured to be "always on" and have a power up delay of 60 seconds to allow the ADSL connection to come up and be the primary connection. The interface will also be configured for use with an ISP, enter the details as shown in the tables below.

Parameter	Setting	Description
Dial-out number	0845 1400101	Replace with the number for your ISP
Use GPRS/PSTN/external modem	PSTN	Use internal PSTN modem
<i>**Use W-WAN/external modem</i>	<i>No</i>	<i>Use internal ISDN modem</i>
Username	User	Replace with your dial up username
Password	Pass	Replace with your dial up password
Always on mode	ON	Interface should always be active
Power up AODI delay (s)	60	Timer to allow main ADSL connection to come up before this one is activated
Inactivity timeout (s)	0	Keep interface in service even if no data passes through interface
Local IP address	0.0.0.0	Your ISP will normally assign an IP address automatically

**** Only applies if configuring ISDN, not PSTN**

Dial-out prefix:	<input type="text"/>
Dial-out number:	<input type="text" value="0845 1400101"/>
Use GPRS/PSTN/external modem:	<input type="text" value="PSTN"/>
Detach GPRS on link failure:	<input type="text" value="No"/>
Detach GPRS between connection attempts:	<input type="text" value="No"/>
Username:	<input type="text" value="user@isp.com"/>
Password (Assigned):	<input type="password" value="*****"/>
Confirm password:	<input type="password" value="*****"/>
AODI NUA:	<input type="text"/>
Always on mode:	<input type="text" value="On"/>
AODI delay (s):	<input type="text" value="0"/>
Power up AODI delay (s):	<input type="text" value="60"/>
Go out of service if first AODI connections fail:	<input type="text" value="No"/>
DNS server:	<input type="text"/>
Multi-link:	<input type="text" value="Off"/>
Inactivity timeout (s):	<input type="text" value="0"/>
Inactivity timeout #2 (s):	<input type="text" value="0"/>
RX packet Inactivity timeout (s):	<input type="text" value="0"/>

Log event up-time (mins):	<input type="text" value="0"/>
Max up-time per day (mins):	<input type="text" value="0"/>
<hr/>	
Local IP address:	<input type="text" value="0.0.0.0"/>
Remote IP address pool minimum:	<input type="text" value="10.11.12.0"/>
Remote IP address pool range:	<input type="text" value="5"/>
Remote network address:	<input type="text" value="0.0.0.0"/>
Remote network mask:	<input type="text" value="255.255.255.255"/>
NAT mode:	<input type="text" value="NAT"/>
NAT source IP address:	<input type="text"/>
<hr/>	
<input type="button" value="OK"/> <input type="button" value="Cancel"/>	

Click OK

Configuration - Interfaces > PPP > PPP 0 - 4 > PPP 4 > Advanced

The PSTN interface needs to be configured so that if PPP 1 (ADSL) is up and in service (i.e. passing data) then this interface is not allowed to initiate a connection.

Parameter	Setting	Description
Inhibit auto-activation when these PPPs are active	1	Inhibit auto-activation of PPP 4 when PPP 1 is active
Inhibit mode	Inhibit if other PPP is active and not OOS	Only inhibit if PPP 1 is passing data

Auto-activation attempts allowed:	0
Post-disconnect activation attempts allowed:	0
Inhibit auto-activation when these PPPs are active:	1
Inhibit mode:	Inhibit if other PPP is active and not OOS
IPSec source IP from interface:	Default
IPSec source IP from interface #:	0

Click OK

2.3 Configure the Default Routes

It is necessary to configure two default routes, one for PPP 1 and one for PPP 4. The PPP 1 default route needs to be set so PPP 4 is deactivated when PPP 1 returns to service after a successful recovery.

Configuration - Routing > Default Route 0

Parameter	Setting	Description
Interface	PPP	Default route 0 is via PPP 1
Interface #	1	
Deactivate interface	PPP	PPP 4 will be deactivated when this route comes back into service after an outage
Deactivate interface #	4	

Configuration - Routing > Default Route 0

Configure: Default IP Route 0

Gateway:	
Source address:	
Source mask:	
Interface:	PPP
Interface #:	1
Connected metric:	1
Disconnected metric:	1
Redial delay:	10
Enqueue only one packet during interface connection period:	No
Initial powerup delay (s):	0
Deactivate Interface:	PPP
Deactivate Interface #:	4
2nd Deactivate Interface:	None
2nd Deactivate Interface #:	0

Click OK

The configuration of default route 1 should be configured as shown.

Configuration - Routing > Default Route 1

Parameter	Setting	Description
Interface	PPP	Default route 1 is via PPP 4
Interface #	4	
Deactivate interface	None	This will allow for recovery to ADSL
Deactivate interface #	0	

Configuration - Routing > Default Route 1

Configure: Default IP Route 1

Gateway:

Source address:

Source mask:

Interface: **PPP**

Interface #:

Connected metric:

Disconnected metric:

Redial delay:

Enqueue only one packet during interface connection period: **No**

Initial powerup delay (s):

Deactivate Interface: **None**

Deactivate Interface #:

2nd Deactivate Interface: **None**

Click OK

2.4 Configure the Firewall

The firewall should be configured to monitor the ICMP requests generated by PPP 1. If the firewall detects that 3 consecutive ICMP echo requests have failed, it will take PPP 1 out of service and deactivated thus allowing PPP 4 to come up. The IP address in the firewall rule must be the IP address that PPP 1 is sending pings to.

The recovery code will then test the ADSL connection before bringing it back into service. When the recovery is successful and PPP 1 comes back into service, PPP 4 will be deactivated.

Configuration – Security > Firewall

Insert the following 2 rules:

Rule 1

```
pass out break end on ppp 1 proto icmp from any to 1.2.3.4 icmp-type echo
inspect-state oos 10 t=3 c=3 d=3 r=ping,10,5 rd=1 dt=1
```

Rule 2

```
Pass break end
```

Configuration - Security > Firewall

Configure: Firewall

H:0	1)	pass out break end on ppp 1 proto icmp from any to 1.2.3.4 icmp-type echo inspect-state oos 10 t=3 c=3 d=3 r=ping,10,5 rd=1 dt=1	<input type="button" value="Delete"/>	<input type="button" value="Insert"/>	<input type="button" value="Edit"/>
H:0	2)	pass break end	<input type="button" value="Delete"/>	<input type="button" value="Insert"/>	<input type="button" value="Edit"/>

Save the firewall rules by clicking the “Save (fw -> fw.txt)” button.

Rule 1 explained:

```
pass out break end on PPP 1 – allow traffic outbound from PPP 1
```

```
proto icmp from any to 1.2.3.4 icmp-type echo – allow pings out to 1.2.3.4
```

`inspect-state` – monitor the pings for echo replies and allow them back in

`oos 10 t=3 c=3 d=3` – if 3 consecutive pings fail, deactivate PPP 1 and start recovery procedures after 10 seconds. This 10 second timer could be increased (by editing the firewall rule) to prevent the Digi Transport from switching rapidly between PPP 1 and PPP 4 in the case where PPP 1 works intermittently. This “oos 10” can be thought of as a de-bounce timer in the context of this application note.

`r=ping,10,5 rd=1 dt=1` – during recovery, test the link every 10 seconds with a ping, allow 5 seconds for the response to each ping, if the recovery fails deactivate the interface and deactivate the link before trying again

Rule 2 then allows all other traffic through.

For a more detailed explanation of the above firewall keywords refer to the Sar/OS reference manual “ftp://ftp1.digi.com/support/documentation/Digi Transport and Sarian User Guide.pdf”

Finally turn the firewall on for PPP 1 to activate the ICMP monitoring and recovery.

Configuration - Interfaces > PPP > PPP 0 - 4 > PPP 1 > Standard

Parameter	Setting	Description
Firewall	ON	Switches the firewall on for this interface

Maximum link up-time (s): 0
Maximum negotiation time (s): 80
Firewall: On
IGMP: Off
IPSec: Off

Click OK

2.5 Save configuration

Save your configuration as the power up configuration.

Administration - Save configuration

Save Config

Save current config to Config

0 (power up)

OK Cancel

The SaveAll button will save the following
Save the current config to config 0.
Save the current firewall.
Save all the sregisters on all ports to profile 0.
Save all PAD parameters on all PADs to profile 0.

SaveAll

Click OK

Reboot the Digi Transport router (or deactivate PPP 1) so the PPP changes take effect.

3 TESTING

3.1 Simulate a failure

To test the fail over and recovery you will need to configure the PPP interface to ping a IP address that you can easily stop responding to ICMP requests (either through the use of a firewall or by physically disconnecting it from the network). You will also need to alter the firewall rule so it monitors the same IP address that PPP 1 is pinging.

Once you have the IP address configured and the Digi Transport router is up on the main WAN link, remove your test device from the network or adjust the firewall so it stops responding to the ICMP requests from the Digi Transport router.

After approximately 30 seconds the router should bring up PPP 4 (the dial-up connection). To confirm that PPP 4 is up and being used you can:

- check the entries in **Diagnostics - Event Log**
- click on **Diagnostics - Status > PPP > PPP 0 - 4 > PPP 4 > View** and check the link is up and has a valid IP address
- click on **Configuration - Routing > Default Route 0** then scroll to the bottom and click on the button 'Show IPv4 Routing Table' to view the routing table which should show PPP 4 with a status of UP and PPP 1 with a status of OOS.
- Also for dial-up, the routers OH and CD LED's should be lit.

Once you have confirmed that the router has failed over correctly, re-enable the ICMP response or re-connect the test device to the network. You should notice that after approximately 20 seconds, the router drops the dial-up connection as the main PPP 1 link becomes available again.

This will again be shown in the event log, the routing table, the PPP 4 status should show Link Inactive, and the OH & CD LED's should go out.

4 CONFIGURATION FILES

4.1 Digi Transport Configuration Files

This is the relevant parts of the configuration file:

```
eth 0 IPAddr "10.1.51.2"  
eth 0 mask "255.255.0.0"
```

```
def_route 0 ll_ent "PPP"  
def_route 0 ll_add 1  
def_route 0 deact_ent "PPP"  
def_route 0 deact_add 4  
def_route 1 ll_ent "PPP"  
def_route 1 ll_add 4  
def_route 2 ll_add 3  
def_route 4 ll_add 4
```

```
ppp 1 IPAddr "0.0.0.0"  
ppp 1 username "user@isp.com"  
ppp 1 epassword "encrypted"  
ppp 1 timeout 0  
ppp 1 aodion 1  
ppp 1 autoassert 1  
ppp 1 do_nat 2  
ppp 1 firewall ON  
ppp 1 pingip "1.2.3.4"  
ppp 1 pingint 10  
ppp 1 pingis ON  
ppp 1 liface "AAL"  
ppp 1 ipanon ON  
ppp 1 ppanon ON  
ppp 1 settledly 100
```

```
ppp 4 IPAddr "0.0.0.0"
```

```
ppp 4 username "user@isp.com"
ppp 4 epassword "encrypted"
ppp 4 phonenum " 0845 1400101"
ppp 4 use_modem 3
ppp 4 aodion 1
ppp 4 pwr_dly 60
ppp 4 autoassert 1
ppp 4 ipsec 1
ppp 4 liface "Default"
ppp 4 inhibitno "1"
ppp 4 inhmode 1
```

```
ana 0 anon ON
ana 0 llon ON
ana 0 xoton OFF
ana 0 lapdon 0
ana 0 lapbon 0
ana 0 logsize 45
```

4.2 Digi Transport Firmware Versions

This is the firmware \ hardware information:

```
Digi TransPort DR6410-HIA DSL2/2+ Router Ser#:60000
Software Build Ver5081. Nov 17 2009 17:49:53 8W
ARM Bios Ver 5.76 v31 197MHz B128-M128-F300-O1841d1,0 MAC:00042d000000
Async Driver Revision: 1.19 Int clk
Ethernet Hub Driver Revision: 1.11
ISDN ST 21150 Driver Revision: 1.7
Firewall Revision: 1.0
EventEdit Revision: 1.0
Timer Module Revision: 1.1
AAL Revision: 1.0
ADSL Revision: 1.0
(B)USBHOST Revision: 1.0
SNA o IP Revision: 1.02
L2TP Revision: 1.10
PPTP Revision: 1.00
TACPLUS Revision: 1.00
MySQL Revision: 0.01
LAPB Revision: 1.12
LAPD Revision: 1.16
TEI Management Revision: 1.6
BRI Call Control Layer Revision: 1.11
X25 Layer Revision: 1.19
MACRO Revision: 1.0
PAD Revision: 1.4
X25 Switch Revision: 1.7
V120 Revision: 1.16
TPAD Interface Revision: 1.12
SCRIBATSK Revision: 1.0
BASTSK Revision: 1.0
ARM Sync Driver Revision: 1.18
TCP (HASH mode) Revision: 1.14
TCP Utils Revision: 1.13
PPP Revision: 1.19
WEB Revision: 1.5
SMTP Revision: 1.1
FTP Client Revision: 1.5
FTP Revision: 1.4
IKE Revision: 1.0
```

PollANS	Revision: 1.2
PPPOE	Revision: 1.0
BRIDGE	Revision: 1.1
MODEM CC (Option 3G)	Revision: 1.4
FLASH Write	Revision: 1.2
Command Interpreter	Revision: 1.38
SSLCLI	Revision: 1.0
OSPF	Revision: 1.0
BGP	Revision: 1.0
QOS	Revision: 1.0
RADIUS Client	Revision: 1.0
SSH Server	Revision: 1.0
SCP	Revision: 1.0
CERT	Revision: 1.0
LowPrio	Revision: 1.0
Tunnel	Revision: 1.2
TEMPLOG	Revision: 1.0
OK	