



# Application Note 35

---

Configuring ADSL to failover to Cellular with automatic testing and recovery back to ADSL.

UK Support

November 2015

## Contents

1	Introduction .....	3
1.1	Outline .....	3
1.2	Assumptions .....	3
1.3	Corrections .....	4
1.4	Version .....	4
2	Configuration .....	5
2.1	Configure PPP 1 (ADSL).....	5
2.2	Configure Auto-Pings .....	7
2.3	Configure Cellular Network (Mobile).....	9
2.4	Configure PPP 3 (Cellular).....	11
2.5	Configure the Default Routes .....	13
2.6	Configure the Firewall.....	15
2.7	Save configuration .....	17
3	Testing .....	19
3.1	Simulate a failure .....	19
4	Configuration files.....	19
4.1	Digi TransPort Configuration Files .....	19
4.2	Digi TransPort Firmware Versions .....	22

# 1 INTRODUCTION

## 1.1 Outline

The document describes how to configure a Digi TransPort router to fail over to a cellular network 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. The cellular interface will be connected to the mobile operator's network with the PPP link up constantly. There should be no charge by the mobile operator when the PPP link is up but not passing traffic as they normally only charge when data is passed over the PPP link. As the cellular PPP link is always available, there is no delay in making the interface & route available.

If it is a requirement that the cellular link is kept down when the ADSL is up, use Application Note 34 but configure PPP 3 instead of PPP 4 as shown.

The main difference between this application note and application note 34 (ADSL failover to PSTN) is that the cellular interface remains up all the time. In application note 34, the (PSTN) dial on demand PPP interface is only brought up when ADSL is deemed to have failed, so the failover time is slightly longer due to the fact that the PSTN link needs to be established before data can be passed.

## 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.

This application note applies to;

**Models shown:** Digi TransPort DR64 router with ADSL & 3G 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 and a working cellular connection through PPP 3.

### 1.3 Corrections

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

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

### 1.4 Version

Status	
1.0	Published
1.1	Revision for new W-WAN usage in the web gui post release 5.036.
2.0	Updated and rebranded

## 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.

Navigate to **Configuration - Network > Interfaces > Advanced > PPP 0 - 9 > PPP 1**

The inactivity timer should be set to 0.

**Configuration - Network > Interfaces > Advanced > PPP 0 - 9 > PPP 1**

Username:

Password:

Confirm password:

Allow the remote device to assign a local IP address to this router

Try to negotiate to use  as the local IP address for this router

Use  as the local IP address for this router (i.e. not negotiable)

Use mask  for this interface

Use the following DNS servers if not negotiated

Primary DNS server:

Secondary DNS server:

DNS Port:

Attempt to assign the following IP configuration to remote devices

Allow this PPP interface to answer incoming calls

Close the PPP connection

after  seconds

if it has been up for  minutes in a day

hrs  mins  secs

Alternative idle timer for static routes  seconds

if the link has not received any packets for  seconds

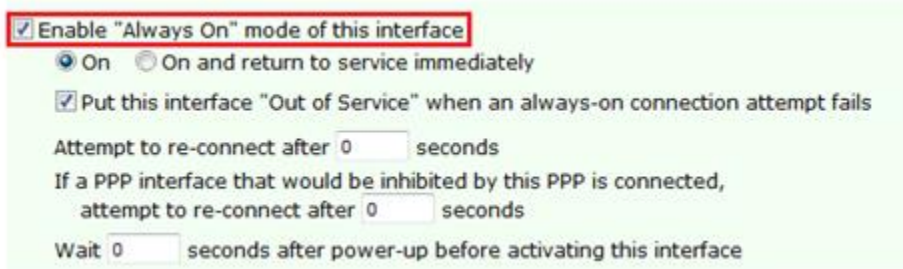
if the negotiation is not complete in  seconds

Parameter	Setting	Description
Username	ADSL Username	Enter the username assigned by your ISP
Password	Password	Enter the assigned password

Confirm password	Password	Re-enter the assigned password
Close PPP connection if it has been idle for (n) seconds	0	Interface is configured to be always connected and active

Navigate to **Configuration - Network > Interfaces > Advanced > PPP 0 - 9 > PPP 1 > Advanced**

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



The screenshot shows the 'Advanced' configuration page for PPP 1. A red box highlights the checked checkbox 'Enable "Always On" mode of this interface'. Below it, the 'On' radio button is selected. Other options include 'Put this interface "Out of Service" when an always-on connection attempt fails' (checked), and three input fields for re-connection delays, all set to 0 seconds.

Parameter	Setting	Description
Enable "Always On" mode for this interface	✓ + ON	Configures interface as always on

Click Apply

## 2.2 Configure Auto-Pings

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.)

Navigate to **Configuration - Network > Interfaces > Advanced > PPP 0 - 9 > PPP 1 > Advanced**

▼ Advanced

Metric: 1

Allow this PPP interface to settle for 100 x 100 milliseconds after the connection has come up

Generate Ping packets on this interface

Send 0 byte pings to IP host 1.2.3.4 every 0 hrs 0 mins 10 secs

Send pings every 0 hrs 0 mins 0 seconds if ping responses are not being received

Switch to sending pings to IP host after 3 failures

Ping responses are expected within 0 seconds

Only send Pings when this interface is "In Service"

New connections to resume with previous Ping interval

Reset the link if no response is received within 0 seconds

Use the ETH 0 IP address as the source IP address

Defer sending pings if IP traffic is being received



Parameter	Setting	Description
Allow this PPP interface to settle for n(100) mSecs after the connection has come up	100	Do not send 1 <sup>st</sup> ping until 10 seconds after interface has come up
Send pings to IP address	1.2.3.4	A public IP address that you can ping to check connectivity via ADSL
Every	10	Send pings every 10 seconds
Only send Pings when this interface is "In Service"	✓	Do not send ICMP requests if using cellular

## 2.3 Configure Cellular Network (Mobile)

Navigate to **Configuration - Network > Interfaces > Mobile**

**Configuration - Network > Interfaces > Mobile**

▼ **Mobile**

Select a SIM to configure from the list below

Settings on this page apply to the selected SIM

SIM: 1 (PPP 1) ▼

IMSI: 234201406613025

▼ **Mobile Settings**

Select the service plan and connection settings used in connecting to the mobile network.

**Mobile Service Provider Settings**

Service Plan / APN:

Use backup APN  Retry the main APN after  0  minutes

SIM PIN:  (Optional)

Confirm SIM PIN:

Username:  (Optional)

Password:  (Optional)

Confirm Password:

**Mobile Connection Settings**

Parameter	Setting	Description
Servie Plan/APN	Your.APN	Enter the APN of your Mobile provider
SIM Pin	<SIM-PIN>	Enter SIM PIN if Required
Username	<Username>	Enter Username if Required
Password	<Password>	Enter Password if Required

Click Apply

## 2.4 Configure PPP 3 (Cellular)

This PPP interface should already be configured for use with the cellular network. Confirm the router has a working cellular connection before proceeding with this configuration.

The PPP 3 connection should be configured to never time out.

Navigate to **Configuration - Network > Interfaces > Advanced > PPP 0 - 9 > PPP 3**

**Configuration - Network > Interfaces > Advanced > PPP 3**

Attempt to assign the following IP configuration to remote devices

Allow this PPP interface to answer incoming calls

Close the PPP connection

after  seconds

if it has been up for  minutes in a day

if it has been idle for  hrs  mins  secs

Alternative idle timer for static routes  seconds

if the link has not received any packets for  seconds

if the negotiation is not complete in  seconds

Enable NAT on this interface

IP address  IP address and Port

NAT Source IP address:

Enable IPsec on this interface

Enable the firewall on this interface

Parameter	Setting	Description
Close PPP connection if it has been idle for "seconds"	0	Interface is always connected and active

Click Apply

The PPP 3 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.

Navigate to **Configuration - Network > Interfaces > Advanced > PPP 0 - 9 > PPP 3 > Advanced**

**Configuration - Network > Interfaces > Advanced > PPP 0 - 9 > PPP 3 > Advanced**

► Mobile  
▼ Advanced

Metric:

Allow this PPP interface to settle for  x 100 milliseconds after the connection has come up

Enable "Always On" mode of this interface

On  On and return to service immediately

Put this interface "Out of Service" when an always-on connection attempt fails

Attempt to re-connect after  seconds

If a PPP interface that would be inhibited by this PPP is connected, attempt to re-connect after  seconds

Wait  seconds after power-up before activating this interface

Parameter	Setting	Description
Enable "Always On" mode for this interface	✓	Configures PPP 3 interface as always on
Wait (n) seconds after power up before activating this interface	60	Timer to allow main ADSL connection to come up before this one is activated

Click Apply

## 2.5 Configure the Default Routes

It is necessary to configure two default routes, one for PPP 1 and one for PPP 3.

Default route 0 is configured for ADSL via PPP 1

Navigate to **Configuration - Network > IP Routing/Forwarding > Static Routes > Default Route 0**

Configuration - Network > IP Routing/Forwarding > Static Routes > Default Route 0

▼ Default Route 0

Description:

Default route via

Gateway:

Interface: PPP ▼ 1

Metric: 1

Parameter	Setting	Description
Interface	PPP	Default Route 0 is via PPP 1
Interface#	1	

Click Apply

Default route 1 is configured for the cellular interface via PPP 3

Navigate to **Configuration - Network > IP Routing/Forwarding > Static Routes > Default Route 1**

▼ Default Route 1

Description:

Default route via

Gateway:

Interface: PPP ▼ 3

Metric:

Parameter	Setting	Description
Interface	PPP	Default Route 1 is via PPP 3
Interface#	3	

Click Apply

## 2.6 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 be deactivated thus allowing PPP 3 to route traffic. 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 PPP 1 back into service. When the recovery is successful and PPP 1 comes back into service and will route traffic via ADSL again.

This example uses 1.2.3.4 and you should substitute this for a valid IP address that can be pinged through the ADSL (PPP 1) interface.

Navigate to **Configuration - Security > Firewall**

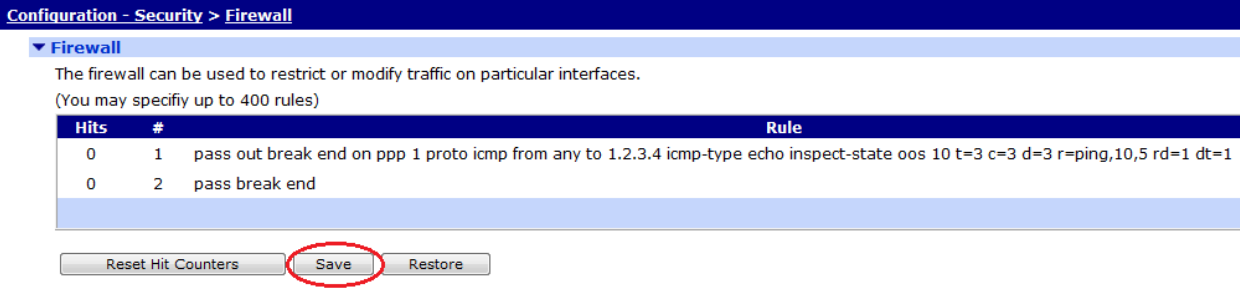
Insert the following 2 rules:

*Rule 1 (replace 1.2.3.4 with the IP address auto-pings are configured for)*

```
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
```



The screenshot shows the Mikrotik configuration page for the Firewall. The title bar reads "Configuration - Security > Firewall". Below the title, there is a section for "Firewall" with a description: "The firewall can be used to restrict or modify traffic on particular interfaces. (You may specify up to 400 rules)". A table lists the configured rules:

Hits	#	Rule
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
0	2	pass break end

At the bottom of the table, there are three buttons: "Reset Hit Counters", "Save", and "Restore". The "Save" button is circled in red.

Save the firewall rules by clicking the **“Save”** button.

Rule 1 explained:

```
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
```

**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 3 in the case where PPP 1 works intermitantly. 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 Digi TransPort Sar/OS User Reference Manual.

Enable the firewall on PPP 1 to activate the ICMP monitoring and recovery.

Navigate to **Configuration - Security > Firewall**

Scroll down to enable the firewall on PPP 1 to activate the ICMP monitoring and recovery.



**Configuration - Security > Firewall**

ETH 15	<input type="checkbox"/>
ETH 16	<input type="checkbox"/>
ETH 17	<input type="checkbox"/>
PPP 0	<input type="checkbox"/>
PPP 1	<input checked="" type="checkbox"/>
PPP 2	<input type="checkbox"/>
PPP 3	<input type="checkbox"/>
PPP 4	<input type="checkbox"/>

Parameter	Setting	Description
PPP 1	✓	Firewall is enabled on PPP 1 interface

Click Apply

**Note:**

It is necessary to reboot the Digi TransPort router (or deactivate PPP 1) so the PPP changes take effect.

## 2.7 Save configuration

Save your configuration as the power up configuration.

Navigate to **Administration - Save configuration**

## Administration - Save configuration

Save current configuration to Config 0 (power up) ▼

Save

Save all configuration. This includes the following

- Save the current configuration to config 0
- Save the current firewall
- Save all registers on all ports to profile 0
- Save all PAD parameters on all PADs to profile 0

Save All

## 3 TESTING

### 3.1 Simulate a failure

To test the fail over and recovery you will need to configure the PPP interface to ping an IP address (referenced as 1.2.3.4 throughout this document) 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 (ADSL), remove your test device from the network or adjust the firewall on the remote host so it stops responding to the ICMP requests from the Digi TransPort router.

After approximately 30 seconds the router should deactivate PPP 1 and route traffic via PPP 3 (the cellular connection).

To confirm that PPP 3 is up and being used you can:

- Check the entries in **Management - Event Log**
- Click on **Management - Network Status > IP Routing Table**

Look at the routing table which should show PPP 3 with a status of UP and PPP 1 with a status of OOS.

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 removes the OOS status from PPP 1, and make default route 0 the primary route.

## 4 CONFIGURATION FILES

### 4.1 Digi TransPort Configuration Files

This is the config.da0 file used for the purpose of this Application Note

```
eth 0 descr "LAN 0"  
eth 0 IPaddr "192.168.1.1"  
eth 1 descr "LAN 1"  
eth 2 descr "LAN 2"  
eth 3 descr "LAN 3"  
eth 4 descr "ATM PVC 0"  
eth 4 do_nat 2  
eth 5 descr "ATM PVC 1"  
eth 5 do_nat 2
```

```
eth 6 descr "ATM PVC 2"
eth 6 do_nat 2
eth 7 descr "ATM PVC 3"
eth 7 do_nat 2
eth 8 descr "ATM PVC 4"
eth 8 do_nat 2
eth 9 descr "ATM PVC 5"
eth 9 do_nat 2
eth 10 descr "ATM PVC 6"
eth 10 do_nat 2
eth 11 descr "ATM PVC 7"
eth 11 do_nat 2
eth 12 descr "Logical"
eth 13 descr "Logical"
eth 14 descr "Logical"
eth 15 descr "Logical"
eth 16 descr "Logical"
addp 0 enable ON
lapb 0 ans OFF
lapb 0 tinact 120
lapb 1 tinact 120
lapb 3 dtemode 0
lapb 4 dtemode 0
lapb 5 dtemode 0
lapb 6 dtemode 0
ip 0 cidr ON
def_route 0 ll_ent "PPP"
def_route 0 ll_add 1
def_route 1 ll_ent "PPP"
def_route 1 ll_add 3
dhcp 0 IPmin "192.168.1.100"
dhcp 0 respdelms 500
dhcp 0 mask "255.255.255.0"
dhcp 0 gateway "192.168.1.1"
dhcp 0 DNS "192.168.1.1"
ppp 0 timeout 300
ppp 1 name "ADSL"
ppp 1 lliface "AAL"
ppp 1 username "user@isp.com"
ppp 1 password "password"
ppp 1 IPaddr "0.0.0.0"
ppp 1 timeout 0
ppp 1 firewall ON
ppp 1 settledly 100
ppp 1 aodion 1
ppp 1 autoassert 1
ppp 1 immoos ON
ppp 1 echo 10
ppp 1 echodropcnt 5
ppp 1 pingip "1.2.3.4"
ppp 1 pingint 10
ppp 1 pingis ON
ppp 3 name "W-WAN (HSPA 3G)"
ppp 3 phonenum "*98*1#"
```

```
ppp 3 username "ENTER WWAN Username"
ppp 3 password "password"
ppp 3 r_addr OFF
ppp 3 IPAddr "0.0.0.0"
ppp 3 l_addr ON
ppp 3 timeout 0
ppp 3 use_modem 1
ppp 3 aodion 1
ppp 3 autoassert 1
ppp 3 immoos ON
ppp 3 pwr_dly 60
ppp 3 l_pap OFF
ppp 3 l_chap OFF
ppp 3 r_chap OFF
ppp 3 defpak 16
ppp 4 defpak 16
modemcc 0 info_asy_add 9
modemcc 0 init_str "+CGQREQ=1"
modemcc 0 init_str1 "+CGQMIN=1"
modemcc 0 apn "internet"
modemcc 0 link_retries 10
modemcc 0 stat_retries 30
modemcc 0 sms_interval 1
modemcc 0 init_str_2 "+CGQREQ=1"
modemcc 0 init_str1_2 "+CGQMIN=1"
modemcc 0 apn_2 "Your.APN.Goes.Here"
modemcc 0 link_retries_2 10
modemcc 0 stat_retries_2 30
modemcc 0 sms_interval_2 1
ana 0 anon ON
ana 0 l1on ON
ana 0 lapdon 0
ana 0 asyon 1
ana 0 logsize 45
cmd 0 unitid "ss%s>"
cmd 0 cmdnua "99"
cmd 0 hostname "digi.router"
cmd 0 tremto 1200
user 1 name "username"
user 1 password "password"
user 1 access 0
user 2 access 0
user 3 access 0
user 4 access 0
user 5 access 0
user 6 access 0
user 7 access 0
user 8 access 0
user 9 access 0
local 0 transaccess 2
sslsvr 0 certfile "cert01.pem"
sslsvr 0 keyfile "privrsa.pem"
ssh 0 hostkey1 "privSSH.pem"
ssh 0 nb_listen 5
```

## 4.2 Digi TransPort Firmware Versions

```
Digi TransPort DR64-HXA1-DE2-XX(MkII) Ser#:155285 HW Revision: 7502a
Software Build Ver5140. Oct 14 2011 19:58:08 9W
ARM Bios Ver 6.35 v35 197MHz B128-M128-F300-0100000,0 MAC:00042d025e95
Power Up Profile: 0
Async Driver          Revision: 1.19  Int clk
Wi-Fi                 Revision: 2.0
Ethernet Port Isolate Driver Revision: 1.11
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
L2TP                  Revision: 1.10
PPTP                  Revision: 1.00
TACPLUS               Revision: 1.00
MySQL                 Revision: 0.01
LAPB                  Revision: 1.12
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
OVPN	Revision: 1.2
TEMPLOG	Revision: 1.0
iDigi	Revision: 2.0