Application Note 38

IP Passthrough on a TransPort WR

Digi Technical Support
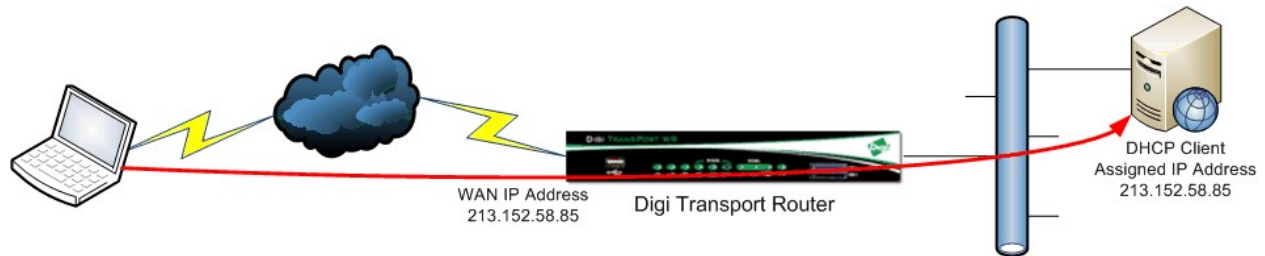
Contents

1   INTRODUCTION

1.1   Outline

IP Passthrough uses DHCP to pass the IP address (and DNS server) that has been assigned to a PPP interface by an ISP, to another device running a DHCP client.

In IP Passthrough mode, the configured PPP and Ethernet interfaces do not use the routing code at all (except for some special cases) when handling received IP packets. Packets received for the PPP interface are delivered directly to a specified Ethernet interface. Similarly, packets received for the specified Ethernet interface (everything except broadcasts/multicasts) are sent to the PPP interface.

"Pinhole" ports can be configured, which provide exceptions for data received on the PPP interface. These exceptions are sent up the stack as usual, allowing, for example, the unit to (still) be remotely configured using telnet and/or HTTP. Operation for all other non-participating "pinhole'd" ports however is unchanged.

NOTE: When I IP Passthrough is configured and PPP is UP, the TransPort DHCP server provides whatever the mobile IP is (the IP assigned to the PPP interface) to the DHCP client, and assigns the first IP address in the 24-bit subnet to its own Ethernet interface. This IP address of the TransPort Ethernet interface gets passed along through DHCP to the client as it's Gateway IP address. For example, if the mobile IP is 1.2.3.4 then the IP address of the Ethernet interface would be 1.2.3.1. Looking at the DHCP client, its IP address would be the same as the mobile IP (1.2.3.4) and its Gateway IP address would be the same as the TransPort's Ethernet IP (1.2.3.1). In the case where the first address is assigned to the client, the router will take the second IP address in the 24-bit subnet range.

So, once IP Passthrough is configured and PPP is UP, the TransPort cannot be accessed anymore via the local address used before (that by default is 192.168.1.1), as it has been changed.

In order to access the router in this condition, the following options are available:

- Local Access: in order to access to the TransPort via the local ETH interface, the new address assigned to the ETH interface by the IP Passthrough configuration needs to be used. It will belong to the subnet of the PPP interface and it can simply be checked issuing the command "ipconfig /all" on the command prompt of the laptop (or similar command to get IP configuration on the device connected to the TransPort) and look for the default gateway, that will be the address to use to connect to the TransPort.

- Remote Address: with IP Passthrough configured, packets received for the PPP interface on the TransPort are delivered directly to the Ethernet interface (so routed to the device connected to it). In order to connect to the TransPort itself and not to the device behind, Pinholes need to be configured. Basically, this means to configure exceptions for some type of traffic (for example http, ssh, etc.) to this behavior, so that those particular types of traffic are not routed to the device behind, but are processed by the TransPort itself.

When I IP Passthrough is configured and PPP is DOWN, the TransPort will automatically provide the IP address of 192.168.1.2 to the DHCP client and assign the IP address 192.168.1.1 to the TransPort Ethernet interface with a 24-bit subnet mask. So in this case, the TransPort will be accessible locally simply using the address 192.168.1.1.

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. It also assumes a basic ability to access and navigate a TransPort router and to configure it with basic routing functions.

This Application Note (AN) applies to:

Model: Digi TransPort WR21

Other Compatible Models: All TransPort WR models

Firmware versions: 5130 and later

NOTE: This AN has been specifically rewritten for firmware release 5.123 and later but the original AN was testing and working for TransPorts running earlier firmware and the previous GUI. TransPorts running earlier firmware will find that the screenshots do not accurately reflect what will be seen on those older routers. Contact tech.support@digi.com if you require this document for the older GUI.

Configuration: This AN assumes the devices are set to their factory default configurations. Most configuration commands are only shown if they differ from the factory default.

For the purpose of this AN, the following applies:

- The TransPort WAN IP address must be in the public address range and fully routable.

1.3 Corrections

Requests for corrections or amendments to this AN are welcome and should be addressed to: tech.support@digi.com

Requests for new ANs can be sent to the same address.

1.4 Version

Version Number	Status
1.0	Published
1.1	Updated for new GUI
2.0	Overall review, updated screenshot to the new GUI, rewritten/tested all for WR21, updated tests part with new tests and correction on formatting
2.1	Updated screenshots and instructions for new web interface, rebranding (Jun 2016)
2.2	Added explanation, test and logs for the case of PPP down and details on accessibility of the device. Overall revision and fix to layout (tables, figure, etc)

2   DIGI WR21 CELLULAR CONFIGURATION

2.1   Configure the Cellular WAN interface

CONFIGURATION - NETWORK > INTERFACES > MOBILE

Parameter	Setting	Description
SIM	1 (PPP 1)	The following config will apply to SIM 1 & PPP 1
Service Plan/APN	internet	Enter the APN of your mobile provider
SIM PIN/Confirm SIM PIN	Your PIN code	The SIM PIN (Optional)
Username/Password	APN Username	Contact your service provider to obtain the APN username/password (Optional)

2.2   Enabling IP Passthrough

IP Passthrough mode essentially turns the TransPort into a bridge, disabling NAT and routing and passing the WAN IP address from the WAN interface to the device connected on the local Interface defined below.

CONFIGURATION - NETWORK > IP PASSTHROUGH

Parameter	Setting	Description
Enable IP Passthough	✓	Enable the IP Passthrough service
Local interface	Ethernet 0	Set the inside interface to ETH 0
Wan PPP interface	1	Set the WAN interface to PPP 1 (as shown in 2.1 mobile settings above)
Ethernet DHCP Mode	Normal/24 bit mask	Sets the DHCP addressing mode for the DHCP server

NOTE: When IP Passthrough is enabled, it will override any DHCP settings you have configured on the specified Ethernet port.

2.3 Configure the Pinholes

Pinholes are services that are terminated on the TransPort instead of being passed through to the connected device. These services are typically used to remotely manage the TransPort.

In this example, HTTP traffic will remain assigned to the TransPort so that it can be administered via the web interface.

Important: If you are enabling IP Passthrough from the cellular network, select the Pinholes you want to assign first, before clicking the Apply button. Otherwise, if you enable IP Passthrough and immediately click Apply (without selecting any pinholes), you WILL lose connectivity to the TransPort's W-WAN interface

CONFIGURATION - NETWORK > IP PASSTHROUGH
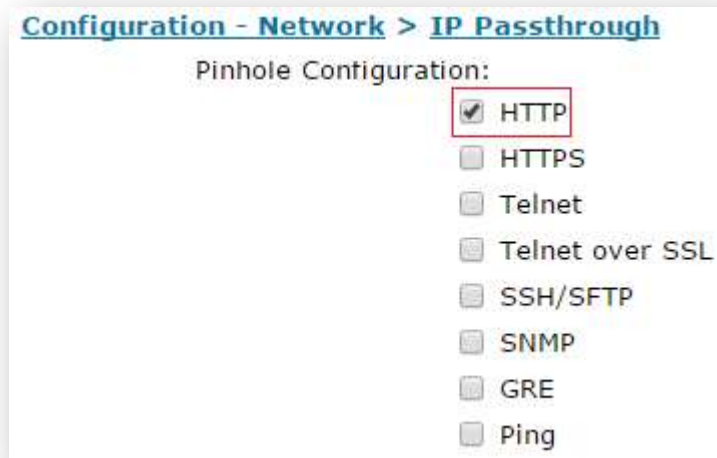
Parameter	Setting	Description
Pinhole Configuration	HTTP ✔	Set the services which will remain assigned to the TransPort

NOTE: In some cases, if the TransPort is itself initiating IP traffic (for example, sending an email alert or features like 'auto ping' and firewall recovery, etc.) then there is an automatic feature which will cause the TransPort to remember not to forward replies to the IP Passthrough client regardless of how the Pinholes are configured.

Protocols that use fixed source ports (for example, IKE for IPSEC) will need "Pinholing" even if the TransPort is making the outgoing connection.

The 'Other Ports' and 'Other Protocols' variable text fields allow the user to Pinhole any TCP/UDP ports or protocol numbers not in the above list. If inputting multiple ports or protocol numbers, separate them by commas.

In the example below, it can be seen how a Pinholes would be configured if the TransPort (not the connected device) is required to listen on port 4000, which is used to relay incoming traffic out of serial port ASY 0.

Parameter	Setting	Description
Other Ports	4000	Enter the Port(s) which you want the router to own

3 ENABLE DHCP CLIENT ON THE IP PASSTHROUGH CLIENT

IP Passthrough should work on any DHCP Client. In this example, a Windows PC has been used.

3.1 Enable DHCP client on the PC

3.1.1 Ethernet Properties

Open the **Local Area Connection Properties**, highlight **Internet Protocol (TCP/IP)**, and double click on it.
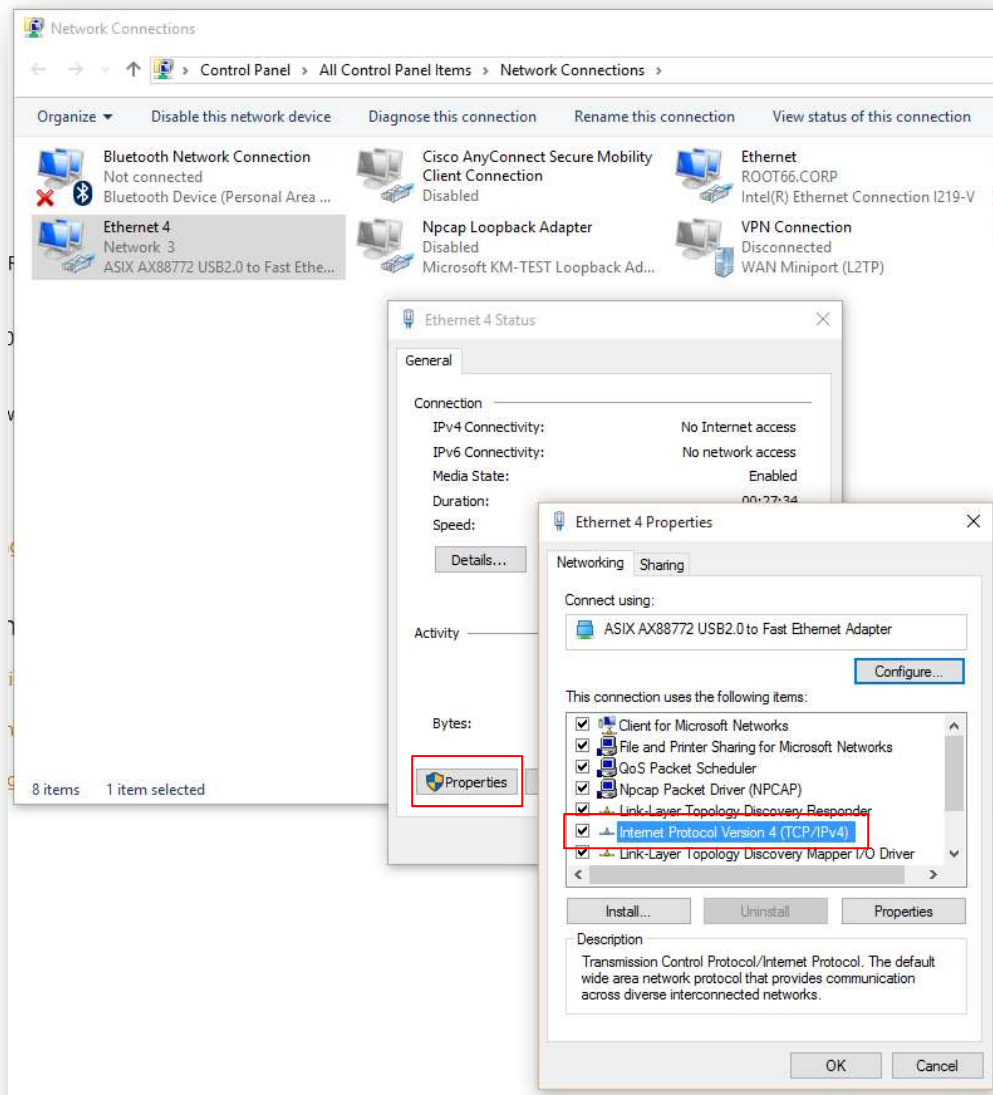
3.1.2 Internet Protocol (TCP/IPv4) Properties
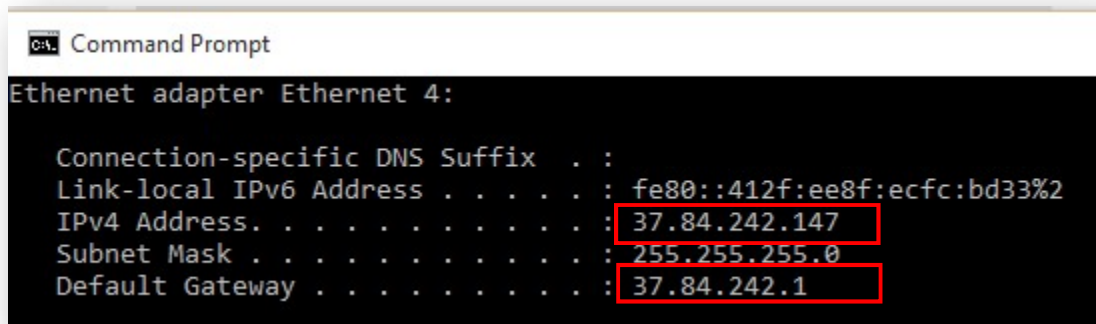
In the Internet Protocol (TCP/IP) Properties, select **Obtain an IP address automatically**, **Obtain DNS server address automatically**, and then click **OK**.
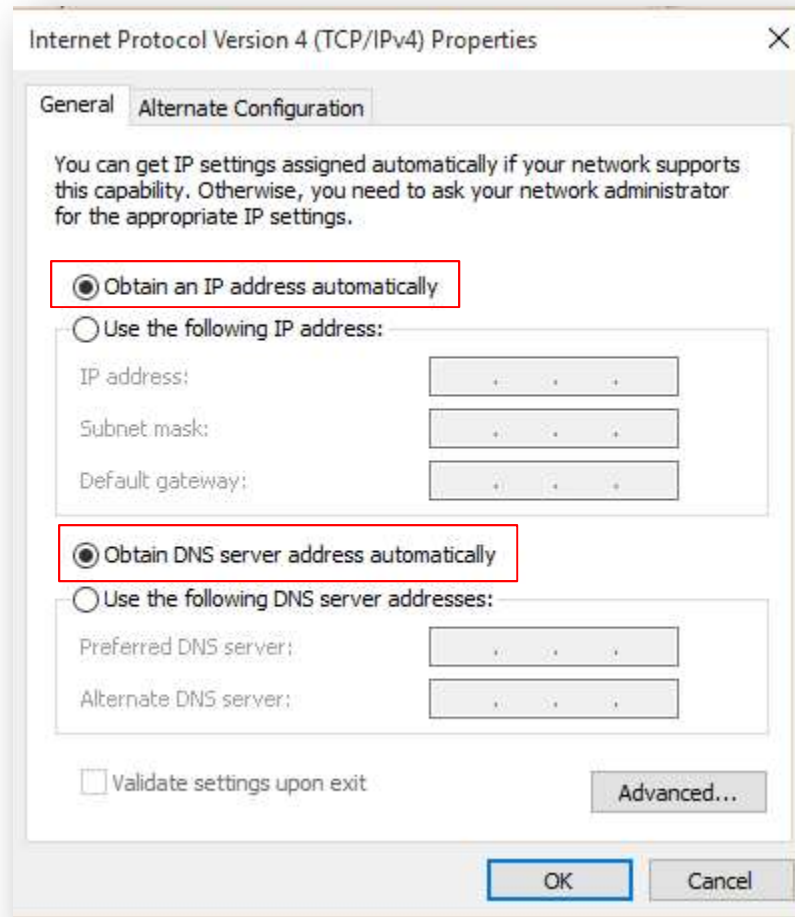
4   TESTING

4.1   Check the assigned IP address with PPP UP

On the PC, open a Command Prompt, and then issue the `ipconfig` command to display the PC's IP address.

As explained above, the default gateway address assigned to the DHCP client is the IP address now assigned to the ETH 0 interface of the TransPort WR, that it will now accessible via this IP:

MANAGEMENT - NETWORK STATUS > INTERFACES > ETHERNET > ETH 0
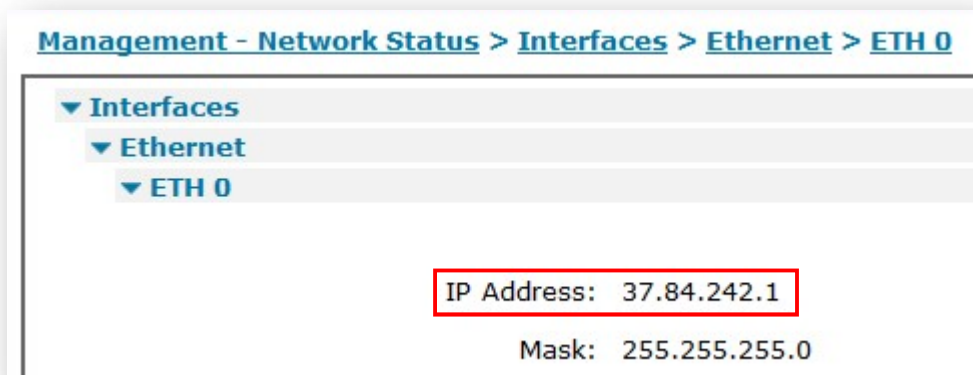
Using the WEB UI, we can also compare the IP address of the DHCP client with the WAN IP address of the TransPort.

The IP address assigned to the PC (the DHCP client) should be the same as that given to the WAN IP address of the TransPort:

MANAGEMENT - NETWORK STATUS > INTERFACES > ADVANCED > PPP > PPP 1.
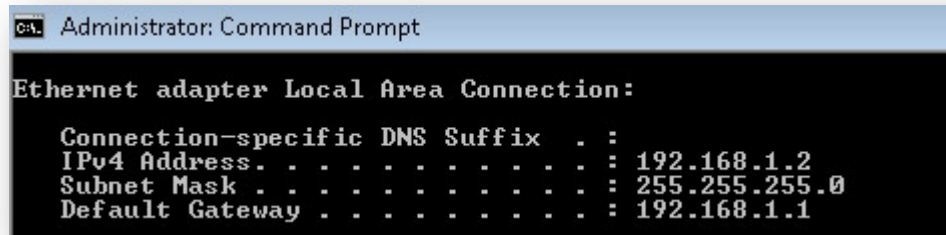
4.2 Check the assigned IP address with PPP DOWN

Simulate a PPP fault and check what address is assigned to the DHCP Client, the client should get an IP of 192.168.1.2 and ta default gateway address of 192.168.1.1 that will be assigned to the ETH0 TransPort interface:

This can also be checked accessing the WEB GUI of the TransPort WR at the address it has now assigned to the ETH 0 Interface (that is the default gateway assigned to the DHCP Client) 192.168.1.1:

MANAGEMENT - NETWORK STATUS > INTERFACES > ETHERNET > ETH 0
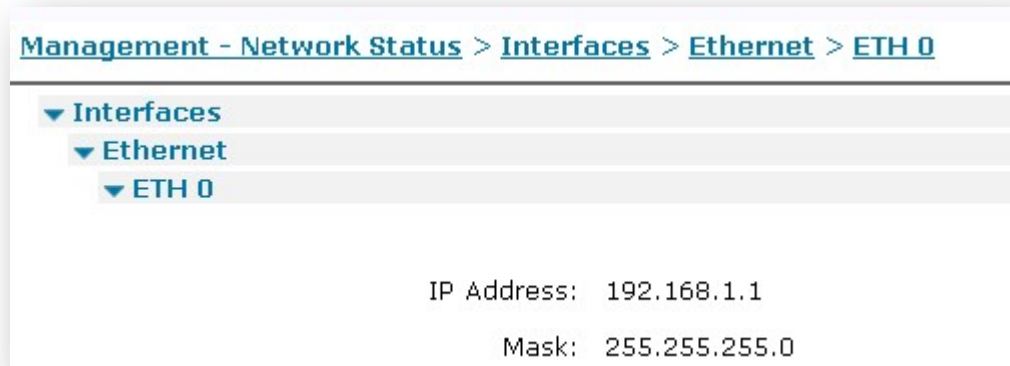
4.3   Examples with TransPort packet Analyser

In this section some examples of packet traces when the IP Passthrough mode is on and working will be shown.

4.3.1   IP Passthrough – No Pinhole

This Analyser trace shows an incoming FTP connection, destined for the TransPort WAN interface, being forwarded to the IP Passthrough client.

NOTE: The pinhole port for FTP is <u>not</u> selected and therefore the TransPort will not terminate the FTP connection.

This is an incoming FTP SYN from 217.151.242.14 to the WAN IP address 37.82.40.232 on the TransPort's WAN interface PPP 1:

```
-----   9-7-2015  13:21:16.370   -------
45 00 00 2C 19 88 00 00 6B 06 1C 64 D9 97 F2 0E      E..,....k..d....
25 52 28 E8 36 F3 00 15 43 01 D4 C8 00 00 00 00      %R(.6...C.......
60 02 7D 78 B1 FB 00 00 02 04 05 B4                  `.}x........


IP (In) From REM TO LOC         IFACE: PPP 1
45                IP Ver:       4
                  Hdr Len:      20
00                TOS:          Routine
                  Delay:        Normal
                  Throughput:   Normal
                  Reliability:  Normal
00 2C             Length:       44
19 88             ID:           6536
00 00             Frag Offset:  0
                  Congestion:   Normal
                                May Fragment
                                Last Fragment
6B                TTL:          107
06                Proto:        TCP
1C 64             Checksum:     7268
D9 97 F2 0E       Src IP:       217.151.242.14
25 52 28 E8       Dst IP:       37.82.40.232
TCP:
36 F3             SRC Port:     ??? (14067)
00 15             DST Port:     FTP CTL (21)
43 01 D4 C8       SEQ Number:   1124193480
00 00 00 00       ACK Number:   0
60 02             Flags
                  Data Offset   24
                                SYN
7D 78             Window:       32120
B1 FB             Checksum:     45563
00 00             URG Ptr:      0
02                TCP_OPT:      MSS (1460)
----------
```

The FTP SYN is then forwarded out of the ETH 0 interface to the IP Passthrough client. Note that the destination IP address remains the same:

```
-----   9-7-2015  13:21:16.370   -------
45 00 00 2C 19 88 00 00 6A 06 1D 64 D9 97 F2 0E    E..,....j..d....
25 52 28 E8 36 F3 00 15 43 01 D4 C8 00 00 00 00    %R(.6...C.......
60 02 7D 78 B1 FB 00 00 02 04 05 B4                `.}x........


IP (Final) From LOC TO REM     IFACE: ETH 0
45              IP Ver:        4
                Hdr Len:       20
00              TOS:           Routine
                Delay:         Normal
                Throughput:    Normal
                Reliability:   Normal
00 2C           Length:        44
19 88           ID:            6536
00 00           Frag Offset:   0
                Congestion:    Normal
                               May Fragment
                               Last Fragment
6A              TTL:           106
06              Proto:         TCP
1D 64           Checksum:      7524
D9 97 F2 0E     Src IP:        217.151.242.14
25 52 28 E8     Dst IP:        37.82.40.232
TCP:
36 F3           SRC Port:      ??? (14067)
00 15           DST Port:      FTP CTL (21)
43 01 D4 C8     SEQ Number:    1124193480
00 00 00 00     ACK Number:    0
60 02           Flags
                Data Offset    24
                               SYN
7D 78           Window:        32120
B1 FB           Checksum:      45563
00 00           URG Ptr:       0
02              TCP_OPT:       MSS (1460)
----------
```

The IP Passthrough client responds with a SYN ACK which is received by the router on ETH 0:

```
-----   9-7-2015  13:21:16.370   -------
45 00 00 2C 0E ED 40 00 80 06 D1 FE 25 52 28 E8    E..,..@.....%R(.
D9 97 F2 0E 00 15 36 F3 8A F6 12 B3 43 01 D4 C9    ......6.....C...
60 12 20 00 71 B9 00 00 02 04 05 B4 00 00          `. .q.........


IP (In) From REM TO LOC        IFACE: ETH 0
45              IP Ver:        4
                Hdr Len:       20
00              TOS:           Routine
                Delay:         Normal
                Throughput:    Normal
                Reliability:   Normal
00 2C           Length:        44
```

```
   0E ED            ID:              3821
   40 00            Frag Offset:     0
                    Congestion:      Normal
                                     Don't Fragment
                                     Last Fragment
   80               TTL:             128
   06               Proto:           TCP
   D1 FE            Checksum:        53758
   25 52 28 E8      Src IP:          37.82.40.232
   D9 97 F2 0E      Dst IP:          217.151.242.14
   TCP:
   00 15            SRC Port:        FTP CTL (21)
   36 F3            DST Port:        ??? (14067)
   8A F6 12 B3      SEQ Number:      2331382451
   43 01 D4 C9      ACK Number:      1124193481
   60 12            Flags
                    Data Offset      24
                                     SYN
                                     ACK
   20 00            Window:          8192
   71 B9            Checksum:        29113
   00 00            URG Ptr:         0
   02               TCP_OPT:         MSS (1460)
   ----------
```

The TransPort then sends the SYN ACK back to the originating IP address from its WAN interface PPP 1:

```
-----    9-7-2015  13:21:16.370   -------
45 00 00 2C 0E ED 40 00 7F 06 D2 FE 25 52 28 E8      E..,..@.....%R(.
D9 97 F2 0E 00 15 36 F3 8A F6 12 B3 43 01 D4 C9      ......6.....C...
60 12 20 00 71 B9 00 00 02 04 05 B4                  `. .q.......


IP (Final) From LOC TO REM      IFACE: PPP 1
45               IP Ver:          4
                 Hdr Len:         20
00               TOS:             Routine
                 Delay:           Normal
                 Throughput:      Normal
                 Reliability:     Normal
00 2C            Length:          44
0E ED            ID:              3821
40 00            Frag Offset:     0
                 Congestion:      Normal
                                  Don't Fragment
                                  Last Fragment
7F               TTL:             127
06               Proto:           TCP
D2 FE            Checksum:        54014
25 52 28 E8      Src IP:          37.82.40.232
D9 97 F2 0E      Dst IP:          217.151.242.14
TCP:
00 15            SRC Port:        FTP CTL (21)
36 F3            DST Port:        ??? (14067)
8A F6 12 B3      SEQ Number:      2331382451
43 01 D4 C9      ACK Number:      1124193481
60 12            Flags
                 Data Offset      24
```

```
                                 SYN
                                 ACK
20 00          Window:          8192
71 B9          Checksum:        29113
00 00          URG Ptr:         0
02             TCP_OPT:         MSS (1460)
```

4.3.2 Inbound connection to a "Pinholed" TCP Port

This Analyser trace shows the start of an incoming connection to the TransPort's web interface on port 80 (HTTP). Because the HTTP port is "Pinholed", the packets will not be forwarded to the IP Passthrough client.

Inbound SYN packet on WAN interface PPP 1:

```
-----   9-7-2015  13:25:46.100   -------
  45 00 00 34 40 6A 40 00 6B 06 B5 79 D9 97 F2 0E     E..4@j@.k..y....
  25 52 28 E8 39 89 00 50 6E 1F 79 C8 00 00 00 00     %R(.9..Pn.y.....
  80 02 20 00 13 6F 00 00 02 04 05 B4 01 03 03 08     .. ..o..........
  01 01 04 02                                         ....

  IP (In) From REM TO LOC        IFACE: PPP 1
  45             IP Ver:         4
                 Hdr Len:        20
  00             TOS:            Routine
                 Delay:          Normal
                 Throughput:     Normal
                 Reliability:    Normal
  00 34          Length:         52
  40 6A          ID:             16490
  40 00          Frag Offset:    0
                 Congestion:     Normal
                                 Don't Fragment
                                 Last Fragment
  6B             TTL:            107
  06             Proto:          TCP
  B5 79          Checksum:       46457
  D9 97 F2 0E    Src IP:         217.151.242.14
  25 52 28 E8    Dst IP:         37.82.40.232
  TCP:
  39 89          SRC Port:       ??? (14729)
  00 50          DST Port:       WEB (80)
  6E 1F 79 C8    SEQ Number:     1847556552
  00 00 00 00    ACK Number:     0
  80 02          Flags
                 Data Offset     32
                                 SYN
  20 00          Window:         8192
  13 6F          Checksum:       4975
  00 00          URG Ptr:        0
  02             TCP_OPT:        MSS (1460)
  01             TCP_OPT:        NOOP
  03             TCP_OPT:        ??? (3)
  01             TCP_OPT:        NOOP
  01             TCP_OPT:        NOOP
  04             TCP_OPT:        ??? (4)
```

Outbound SYN ACK response on WAN interface PPP 1:

```
-----   9-7-2015  13:25:46.100   -------
45 00 00 2C 6A 62 00 00 FA 06 3C 89 25 52 28 E8        E..,jb....<.%R(.
D9 97 F2 0E 00 50 39 89 C4 F8 23 3A 6E 1F 79 C9        .....P9...#:n.y.
60 12 20 00 54 7D 00 00 02 04 05 78                    `. .T}.....x

IP (Final) From LOC TO REM     IFACE: PPP 1
45              IP Ver:        4
                Hdr Len:       20
00              TOS:           Routine
                Delay:         Normal
                Throughput:    Normal
                Reliability:   Normal
00 2C           Length:        44
6A 62           ID:            27234
00 00           Frag Offset:   0
                Congestion:    Normal
                               May Fragment
                               Last Fragment
FA              TTL:           250
06              Proto:         TCP
3C 89           Checksum:      15497
25 52 28 E8     Src IP:        37.82.40.232
D9 97 F2 0E     Dst IP:        217.151.242.14
TCP:
00 50           SRC Port:      WEB (80)
39 89           DST Port:      ??? (14729)
C4 F8 23 3A     SEQ Number:    3304596282
6E 1F 79 C9     ACK Number:    1847556553
60 12           Flags
                Data Offset    24
                               SYN
                               ACK
20 00           Window:        8192
54 7D           Checksum:      21629
00 00           URG Ptr:       0
02              TCP_OPT:       MSS (1400)
----------
```

Inbound ACK response on WAN interface PPP 1:

```
-----   9-7-2015  13:25:46.180   -------
  45 00 00 28 40 6B 40 00 6C 06 B4 84 D9 97 F2 0E      E..(@k@.l.......
  25 52 28 E8 39 88 00 50 98 80 34 39 81 40 8B EE      %R(.9..P..49.@..
  50 10 FB 90 86 A2 00 00                               P.......

  IP (In) From REM TO LOC        IFACE: PPP 1
  45              IP Ver:        4
                  Hdr Len:       20
  00              TOS:           Routine
                  Delay:         Normal
                  Throughput:    Normal
                  Reliability:   Normal
  00 28           Length:        40
  40 6B           ID:            16491
```

```
40 00            Frag Offset:    0
                 Congestion:     Normal
                                 Don't Fragment
                                 Last Fragment
6C               TTL:            108
06               Proto:          TCP
B4 84            Checksum:       46212
D9 97 F2 0E      Src IP:         217.151.242.14
25 52 28 E8      Dst IP:         37.82.40.232
TCP:
39 88            SRC Port:       ??? (14728)
00 50            DST Port:       WEB (80)
98 80 34 39      SEQ Number:     2558538809
81 40 8B EE      ACK Number:     2168490990
50 10            Flags
                 Data Offset     20
                                 ACK
FB 90            Window:         64400
86 A2            Checksum:       34466
00 00            URG Ptr:        0
----------
```

4.3.3 Outbound Connection from IP Passthrough client

Example of the IP Passthrough client making an outbound telnet connection. The trace shows the 3-way handshake of a TCP socket (SYN, SYN ACK, ACK) on port 23.

Incoming Telnet SYN packet on interface ETH 0 from the IP Passthrough client.
Note that the source IP address is the same as the routers WAN interface.

```
-----   9-7-2015  13:32:35.710   -------
 45 00 00 34 28 7A 40 00 80 06 EA B1 25 52 28 E8      E..4(z@.....%R(.
 C2 D5 D6 88 D4 05 00 17 0B 34 77 5F 00 00 00 00      .........4w_....
 80 02 20 00 10 C8 00 00 02 04 05 B4 01 03 03 08      .. .............
 01 01 04 02                                          ....

 IP (In) From REM TO LOC        IFACE: ETH 0
 45               IP Ver:        4
                  Hdr Len:       20
 00               TOS:           Routine
                  Delay:         Normal
                  Throughput:    Normal
                  Reliability:   Normal
 00 34            Length:        52
 28 7A            ID:            10362
 40 00            Frag Offset:   0
                  Congestion:    Normal
                                 Don't Fragment
                                 Last Fragment
 80               TTL:           128
 06               Proto:         TCP
 EA B1            Checksum:      60081
 25 52 28 E8      Src IP:        37.82.40.232
 C2 D5 D6 88      Dst IP:        194.213.214.136
 TCP:
 D4 05            SRC Port:      ??? (54277)
 00 17            DST Port:      TELNET (23)
 0B 34 77 5F      SEQ Number:    187987807
```

```
   00 00 00 00    ACK Number:    0
   80 02          Flags
                  Data Offset    32
                                 SYN
   20 00          Window:        8192
   10 C8          Checksum:      4296
   00 00          URG Ptr:       0
   02             TCP_OPT:       MSS (1460)
   01             TCP_OPT:       NOOP
   03             TCP_OPT:       ??? (3)
   01             TCP_OPT:       NOOP
   01             TCP_OPT:       NOOP
   04             TCP_OPT:       ??? (4)
   ----------
```

The telnet SYN packet is forwarded out of the TransPort's WAN interface (PPP 1) to the remote device:

```
-----    9-7-2015  13:32:35.710   -------
45 00 00 34 28 7A 40 00 7F 06 EB B1 25 52 28 E8      E..4(z@.....%R(.
C2 D5 D6 88 D4 05 00 17 0B 34 77 5F 00 00 00 00      .........4w_....
80 02 20 00 10 C8 00 00 02 04 05 B4 01 03 03 08      .. .............
01 01 04 02                                          ....

IP (Final) From LOC TO REM    IFACE: PPP 1
45             IP Ver:        4
               Hdr Len:       20
00             TOS:           Routine
               Delay:         Normal
               Throughput:    Normal
               Reliability:   Normal
00 34          Length:        52
28 7A          ID:            10362
40 00          Frag Offset:   0
               Congestion:    Normal
                              Don't Fragment
                              Last Fragment
7F             TTL:           127
06             Proto:         TCP
EB B1          Checksum:      60337
25 52 28 E8    Src IP:        37.82.40.232
C2 D5 D6 88    Dst IP:        194.213.214.136
TCP:
D4 05          SRC Port:      ??? (54277)
00 17          DST Port:      TELNET (23)
0B 34 77 5F    SEQ Number:    187987807
00 00 00 00    ACK Number:    0
80 02          Flags
               Data Offset    32
                              SYN
20 00          Window:        8192
10 C8          Checksum:      4296
00 00          URG Ptr:       0
02             TCP_OPT:       MSS (1460)
01             TCP_OPT:       NOOP
03             TCP_OPT:       ??? (3)
01             TCP_OPT:       NOOP
01             TCP_OPT:       NOOP
04             TCP_OPT:       ??? (4)
```

The incoming telnet SYN ACK response from the remote device comes in on the WAN interface (PPP 1):

```
    -----   9-7-2015  13:32:35.800   -------
    45 00 00 2C 2E BB 00 00 E9 06 BB 78 C2 D5 D6 88       E..,.......x....
    25 52 28 E8 00 17 D4 05 A1 AB 1C 92 0B 34 77 60       %R(..........4w`
    60 12 20 00 7C BB 00 00 02 04 04 88                   `. .|.......

    IP (In) From REM TO LOC       IFACE: PPP 1
    45              IP Ver:       4
                    Hdr Len:      20
    00              TOS:          Routine
                    Delay:        Normal
                    Throughput:   Normal
                    Reliability:  Normal
    00 2C           Length:       44
    2E BB           ID:           11963
    00 00           Frag Offset:  0
                    Congestion:   Normal
                                  May Fragment
                                  Last Fragment
    E9              TTL:          233
    06              Proto:        TCP
    BB 78           Checksum:     47992
    C2 D5 D6 88     Src IP:       194.213.214.136
    25 52 28 E8     Dst IP:       37.82.40.232
    TCP:
    00 17           SRC Port:     TELNET (23)
    D4 05           DST Port:     ??? (54277)
    A1 AB 1C 92     SEQ Number:   2712345746
    0B 34 77 60     ACK Number:   187987808
    60 12           Flags
                    Data Offset   24
                                  SYN
                                  ACK
    20 00           Window:       8192
    7C BB           Checksum:     31931
    00 00           URG Ptr:      0
    02              TCP_OPT:      MSS (1160)
    ----------
```

The telnet SYN ACK response is then forwarded to the IP Passthrough client on interface ETH 0:

```
-----   9-7-2015  13:32:35.800   -------
45 00 00 2C 2E BB 00 00 E8 06 BC 78 C2 D5 D6 88       E..,.......x....
25 52 28 E8 00 17 D4 05 A1 AB 1C 92 0B 34 77 60       %R(..........4w`
60 12 20 00 7C BB 00 00 02 04 04 88                   `. .|.......

IP (Final) From LOC TO REM     IFACE: ETH 0
45              IP Ver:       4
                Hdr Len:      20
00              TOS:          Routine
                Delay:        Normal
                Throughput:   Normal
                Reliability:  Normal
00 2C           Length:       44
2E BB           ID:           11963
```

```
00 00            Frag Offset:    0
                 Congestion:     Normal
                                 May Fragment
                                 Last Fragment
E8               TTL:            232
06               Proto:          TCP
BC 78            Checksum:       48248
C2 D5 D6 88      Src IP:         194.213.214.136
25 52 28 E8      Dst IP:         37.82.40.232
TCP:
00 17            SRC Port:       TELNET (23)
D4 05            DST Port:       ??? (54277)
A1 AB 1C 92      SEQ Number:     2712345746
0B 34 77 60      ACK Number:     187987808
60 12            Flags
                 Data Offset     24
                                 SYN
                                 ACK
20 00            Window:         8192
7C BB            Checksum:       31931
00 00            URG Ptr:        0
02               TCP_OPT:        MSS (1160)
----------
```

The ACK response to the SYN ACK comes into interface ETH 0 from the IP Passthrough client:

```
   -----   9-7-2015  13:32:35.800   -------
 45 00 00 28 28 7B 40 00 80 06 EA BC 25 52 28 E8      E..(({@.....%R(.
 C2 D5 D6 88 D4 05 00 17 0B 34 77 60 A1 AB 1C 93      .........4w`....
 50 10 FD C0 B5 8B 00 00 00 00 00 00 00 00            P.............


IP (In) From REM TO LOC         IFACE: ETH 0
45               IP Ver:         4
                 Hdr Len:        20
00               TOS:            Routine
                 Delay:          Normal
                 Throughput:     Normal
                 Reliability:    Normal
00 28            Length:         40
28 7B            ID:             10363
40 00            Frag Offset:    0
                 Congestion:     Normal
                                 Don't Fragment
                                 Last Fragment
80               TTL:            128
06               Proto:          TCP
EA BC            Checksum:       60092
25 52 28 E8      Src IP:         37.82.40.232
C2 D5 D6 88      Dst IP:         194.213.214.136
TCP:
D4 05            SRC Port:       ??? (54277)
00 17            DST Port:       TELNET (23)
0B 34 77 60      SEQ Number:     187987808
A1 AB 1C 93      ACK Number:     2712345747
50 10            Flags
                 Data Offset     20
                                 ACK
FD C0            Window:         64960
B5 8B            Checksum:       46475
```

```
  00 00          URG Ptr:        0
```

The ACK response from the IP Passthrough client is sent to the remote device out of the WAN interface (PPP 1):

```
-----   9-7-2015  13:32:35.800   -------
45 00 00 28 28 7B 40 00 7F 06 EB BC 25 52 28 E8      E..(({@.....%R(.
C2 D5 D6 88 D4 05 00 17 0B 34 77 60 A1 AB 1C 93      .........4w`....
50 10 FD C0 B5 8B 00 00                              P.......

IP (Final) From LOC TO REM    IFACE: PPP 1
45              IP Ver:        4
                Hdr Len:       20
00              TOS:           Routine
                Delay:         Normal
                Throughput:    Normal
                Reliability:   Normal
00 28           Length:        40
28 7B           ID:            10363
40 00           Frag Offset:   0
                Congestion:    Normal
                               Don't Fragment
                               Last Fragment
7F              TTL:           127
06              Proto:         TCP
EB BC           Checksum:      60348
25 52 28 E8     Src IP:        37.82.40.232
C2 D5 D6 88     Dst IP:        194.213.214.136
TCP:
D4 05           SRC Port:      ??? (54277)
00 17           DST Port:      TELNET (23)
0B 34 77 60     SEQ Number:    187987808
A1 AB 1C 93     ACK Number:    2712345747
50 10           Flags
                Data Offset    20
                               ACK
FD C0           Window:        64960
B5 8B           Checksum:      46475
00 00           URG Ptr:       0
```

4.3.4 Outbound Connection from the TransPort

Example of when the router makes an outbound telnet connection. There is no change in configuration from the previous example but because the TransPort itself is the initiator, the IP Passthrough client is not involved.

The trace shows the 3-way handshake of a TCP socket (SYN, SYN ACK, ACK) on port 23.

Outbound telnet SYN packet on WAN interface PPP 1:

```
-----   9-7-2015  13:41:23.920   -------
45 00 00 2C 8F CA 00 00 F9 06 4A 69 25 52 28 E8      E..,......Ji%R(.
C2 D5 D6 88 7D FC 00 17 28 7B 50 F1 00 00 00 00      ....}...({P.....
60 02 20 00 99 4A 00 00 02 04 05 78                  `. ..J.....x
```

```
IP (Final) From LOC TO REM    IFACE: PPP 1
45              IP Ver:       4
                Hdr Len:      20
00              TOS:          Routine
                Delay:        Normal
                Throughput:   Normal
                Reliability:  Normal
00 2C           Length:       44
8F CA           ID:           36810
00 00           Frag Offset:  0
                Congestion:   Normal
                              May Fragment
                              Last Fragment
F9              TTL:          249
06              Proto:        TCP
4A 69           Checksum:     19049
25 52 28 E8     Src IP:       37.82.40.232
C2 D5 D6 88     Dst IP:       194.213.214.136
TCP:
7D FC           SRC Port:     ??? (32252)
00 17           DST Port:     TELNET (23)
28 7B 50 F1     SEQ Number:   679170289
00 00 00 00     ACK Number:   0
60 02           Flags
                Data Offset   24
                              SYN
20 00           Window:       8192
99 4A           Checksum:     39242
00 00           URG Ptr:      0
02              TCP_OPT:      MSS (1400)
----------
```

Incoming telnet SYN ACK response on WAN interface PPP 1:

```
  -----   9-7-2015  13:41:23.990   -------
  45 00 00 2C 39 33 00 00 E9 06 B1 00 C2 D5 D6 88     E..,93..........
  25 52 28 E8 00 17 7D FC FA 45 D8 E7 28 7B 50 F2     %R(...}..E..({P.
  60 12 20 00 C6 FB 00 00 02 04 04 88                 `. .........

  IP (In) From REM TO LOC       IFACE: PPP 1
  45              IP Ver:       4
                  Hdr Len:      20
  00              TOS:          Routine
                  Delay:        Normal
                  Throughput:   Normal
                  Reliability:  Normal
  00 2C           Length:       44
  39 33           ID:           14643
  00 00           Frag Offset:  0
                  Congestion:   Normal
                                May Fragment
                                Last Fragment
  E9              TTL:          233
  06              Proto:        TCP
  B1 00           Checksum:     45312
  C2 D5 D6 88     Src IP:       194.213.214.136
  25 52 28 E8     Dst IP:       37.82.40.232
  TCP:
  00 17           SRC Port:     TELNET (23)
```

```
   7D FC          DST Port:      ??? (32252)
   FA 45 D8 E7    SEQ Number:    4198881511
   28 7B 50 F2    ACK Number:    679170290
   60 12          Flags
                  Data Offset    24
                                 SYN
                                 ACK
   20 00          Window:        8192
   C6 FB          Checksum:      50939
   00 00          URG Ptr:       0
   02             TCP_OPT:       MSS (1160)
   ---------
```

Outbound telnet ACK response on WAN interface PPP 1:

```
-----   9-7-2015  13:41:23.990   -------
45 00 00 28 8F CB 00 00 FA 06 49 6C 25 52 28 E8      E..(......Il%R(.
C2 D5 D6 88 7D FC 00 17 28 7B 50 F2 FA 45 D8 E8      ....}...({P..E..
50 10 20 00 DD 8C 00 00                              P. .....

IP (Final) From LOC TO REM     IFACE: PPP 1
45             IP Ver:         4
               Hdr Len:        20
00             TOS:            Routine
               Delay:          Normal
               Throughput:     Normal
               Reliability:    Normal
00 28          Length:         40
8F CB          ID:             36811
00 00          Frag Offset:    0
               Congestion:     Normal
                               May Fragment
                               Last Fragment
FA             TTL:            250
06             Proto:          TCP
49 6C          Checksum:       18796
25 52 28 E8    Src IP:         37.82.40.232
C2 D5 D6 88    Dst IP:         194.213.214.136
TCP:
7D FC          SRC Port:       ??? (32252)
00 17          DST Port:       TELNET (23)
28 7B 50 F2    SEQ Number:     679170290
FA 45 D8 E8    ACK Number:     4198881512
50 10          Flags
               Data Offset     20
                               ACK
20 00          Window:         8192
DD 8C          Checksum:       56716
00 00          URG Ptr:        0----------
```

5   CONFIGURATION AND FIRMWARE/HARDWARE

5.1   WR21 configuration file

This is the config.da0 file used for the purpose of this AN:

```
eth 0 ipanon ON
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
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"
sntp 0 server "time.etherios.com"
dyndns 0 epassword "PTNzVEQdFA=="
ppp 0 timeout 300
ppp 1 name "W-WAN (HSPA 3G)"
ppp 1 phonenum "*98*1#"
ppp 1 IPaddr "0.0.0.0"
ppp 1 timeout 0
ppp 1 use_modem 1
ppp 1 aodion 1
ppp 1 autoassert 1
ppp 1 ipanon ON
ppp 1 r_chap OFF
ppp 3 defpak 16
ppp 4 defpak 16
passthru 0 locadd 0
passthru 0 enabled ON
passthru 0 http ON
web 0 prelogin_info ON
web 0 showgswiz ON
modemcc 0 info_asy_add 3
modemcc 0 init_str "+CGQREQ=1"
modemcc 0 init_str1 "+CGQMIN=1"
modemcc 0 apn "internet.t-d1.de"
modemcc 0 link_retries 10
modemcc 0 stat_retries 30
modemcc 0 sms_interval 1
modemcc 0 sms_access 1
modemcc 0 sms_concat 0
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_access_2 1
modemcc 0 sms_concat_2 0
ana 0 anon ON
ana 0 l2on OFF
ana 0 xoton OFF
ana 0 lapdon 0
ana 0 lapbon 0
ana 0 ipfilt "~21"
ana 0 maxdata 1500
ana 0 logsize 180
cmd 0 unitid "ss%s>"
cmd 0 cmdnua "99"
cmd 0 hostname "digi.router"
cmd 0 asyled_mode 2
cmd 0 tremto 1200
cmd 0 rcihttp ON
user 0 access 0
user 1 name "username"
user 1 epassword "KD5lSVJDVVg="
user 1 access 0
user 2 epassword "PDZxU0FFQFU="
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
ssh 0 v1 OFF
templog 0 mo_autooff ON
cloud 0 ssl ON

Power Up Profile: 0
```

5.2 Hardware and Firmware

```
Digi TransPort WR21-UX2B-DE1-XX Ser#:237416
Software Build Ver5.2.11.4.  Jun  5 2015 04:39:32  WW
ARM Bios Ver 7.42u v43 454MHz B987-M995-F80-O8140,0 MAC:00042d039f68
Async Driver             Revision: 1.19  Int clk
Ethernet Port Isolate Driver Revision: 1.11
Firewall                 Revision: 1.0
EventEdit                Revision: 1.0
Timer Module             Revision: 1.1
(B)USBHOST               Revision: 1.0
L2TP                     Revision: 1.10
PPTP                     Revision: 1.00
TACPLUS                  Revision: 1.00
MODBUS                   Revision: 0.00
RealPort                 Revision: 0.00
MultiTX                  Revision: 1.00
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
GPS                      Revision: 1.0
TELITUPD                 Revision: 1.0
SCRIBATSK                Revision: 1.0
BASTSK                   Revision: 1.0
PYTHON                   Revision: 1.0
CLOUDSMS                 Revision: 1.0
TCP (HASH mode)          Revision: 1.14
TCP Utils                Revision: 1.13
PPP                      Revision: 5.2
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 (Ericsson 3G)   Revision: 5.2
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
PWRCTRL                  Revision: 1.0
RADIUS Client            Revision: 1.0
SSH Server               Revision: 1.0
SCP                      Revision: 1.0
SSH Client               Revision: 1.0
CERT                     Revision: 1.0
```

```
LowPrio                    Revision: 1.0
Tunnel                     Revision: 1.2
OVPN                       Revision: 1.2
TEMPLOG                    Revision: 1.0
QDL                        Revision: 1.0
OK
```