

Applies to the following product

- IPLink™ Model 2620/KK

Application Overview

This application note describes how to configure your IPLink router to use both WAN ports in a dual-routed application. WAN port 1 connects to your upstream network, which may be the ISP, and is the default gateway for your private network. This is “Subnet 1” in figure 1. WAN port 2 can be connected to either a remote office or to a DMZ which is on the same subnet (Subnet 2 in figure 1) as the Ethernet port. NAT can be enabled between the two subnets. This lets you use private IP addresses ensuring the internal network structure is invisible to users on the Internet. The issue of security with comprehensive NAT configuration is outside the scope of this application note, but will be addressed in another.

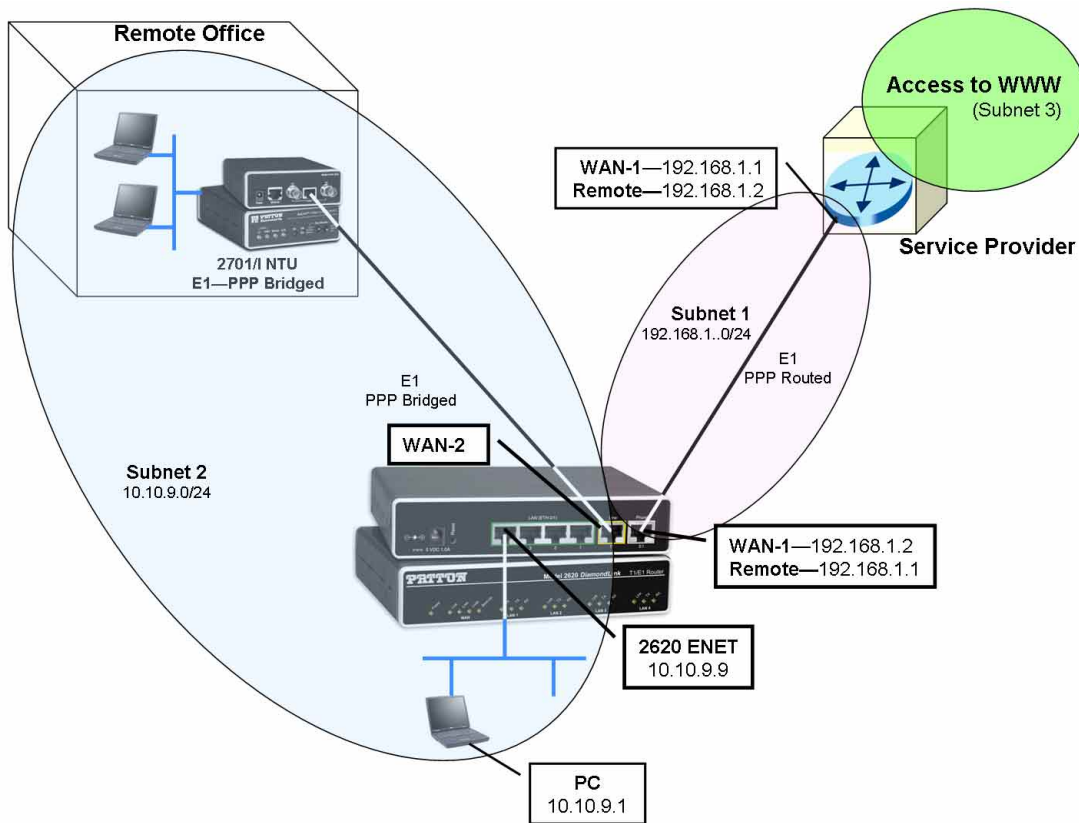


Figure 1. Dual-routed application with remote office on same subnet of Ethernet port

IP Addressing.

The IP address and subnet mask of the Ethernet port is 10.10.9.9/24.

WAN port 1 connects to the upstream router on the 192.168.1.0/24 subnet. WAN port 1 may obtain its IP address via DHCP from the ISP or it may be configured with a fixed IP address if the appropriate arrangement is made with the ISP.

WAN port 2 and the Ethernet port are on the 10.10.9.0/24 subnet, so traffic is bridged between the two interface ports. However IP traffic is routed between Subnet 1 and Subnet 2.

NAT configuration sets WAN port 1 as the “external” environment. WAN port 2 and the Ethernet port are “internal” and the firewall would be configured to protect users in the main and remote offices.

PPP or Frame Relay.

Either PPP or Frame Relay communication links may be used. In this example, WAN port 1 is configured as a routed PPP connection. WAN port 2 is bridged PPP because the users in the main office (on the IPLink’s Ethernet) and the users in the remote office are on the same subnet, hence a bridged connection is the correct selection.

Detailed Information

You will need the following information to correctly define the configurable parameters for this IPLink application.

Upstream Router Details

The upstream router provides access to the Internet and has the following characteristics.

- Channelized E1 (G.703/G.704)
 - HDB3 line coding
 - 120 Ohm twisted pair connection
 - As master clock, the upstream router provides the clock to the 2620 WAN port 1.
 - Time Slots: 1 - 31
- WAN Service
 - Routed PPP
 - Assumes that the 2620 is configured with a fixed IP address assigned by the ISP
 - Router IP address & subnet mask: 192.168.1.1/24

2620/KK WAN Port 1 configuration parameters

These are the configurable parameters for WAN port 1 on the 2620/KK IPLink.

- Channelized E1 (G.703/G.704)
 - HDB3 line coding
 - 120 Ohm twisted pair connection
 - Clocking mode-derived from the E1 (Receive Clock)
 - Time Slots: 1-31
- WAN Service
 - Routed PPP
 - Interface 1 (WAN Port 1)
 - Local WAN IP address and subnet mask: 192.168.1.2/24

- Remote IP address and subnet mask (of the upstream router): 192.168.1.1/24
- No authentication

2620/KK Ethernet port parameters

The Ethernet port defines the IP subnet for WAN port 2.

- IP parameters
 - IP address: 10.10.9.9
 - Netmask: 255.255.255.0
 - IP subnet: 10.10.9.0/24
 - Gateway route: 192.168.1.2

2620/KK WAN Port 2 configurable parameters

The second WAN port is configured as follows:

- Channelized E1 (G.703/G.704)
 - HDB3 line coding
 - 120 Ohm twisted line pair connection
 - Clocking: Not a configurable parameter. WAN port 2 derives clock from WAN 1 to synchronize the transmitted signal on WAN port 2.
 - Time Slots: 1-31
- WAN Service parameters
 - Bridged PPP
 - Interface 2: WAN port 2
 - No authentication

Initial Configuration

Install and configure your IPLink WAN Access Router according to the directions in the *2603 & 2620 IPLink Quick Start Guide*, shipped with your router (and available online at www.patton.com/manuals). When correctly installed:

- The Ethernet port will connect to the same Ethernet LAN as your PC
- You can access the web management pages for configuration on the 2620/KK.

Access the IPLink Web Management Home Page

Access the IPLink Web Management Home page (see [figure 2](#) on page 5) by using a web browser on your PC. Enter the IPLink's IP address and log in to the IPLink.

The IPLink home page is divided into two panes, a **configuration menu pane** on the left, and a **configuration information pane** on the right. You will use the *configuration menu pane* to navigate from page to page. You will use the *configuration information pane* to view and modify configurable parameters, and to view IPLink system status information.

If unable to access the web management pages

Check these items if you are unable to access the 2620/KK's management pages.

1. Verify that your PC and the 2620/KK are on the same subnet
2. Can you ping the 2620/KK from the PC? Can you ping the PC from the 2620/KK?
3. Check to see whether the Link/Act LED on the 2620/KK is lit. If not, the 2620/KK does not see an Ethernet signal from your PC.

WAN Ports 1 and 2 - Clocking configuration

The most critical issue to understand about the two WAN ports on the 2620/KK is the clocking mode. Notice that WAN port 2 does not have any clocking mode parameters, because WAN port 2 uses the clocking of WAN port 1 for its clocking source.

WAN port 1 on the other hand can derive its clocking source from either the 2620/KK's internal clock or from the received T1/E1 signal. In this example, we are assuming that WAN Port 1 is connecting to a service provider. Consequently we want to use its clock as the synchronizing source. In other words, configure Clocking Mode to *receive*.

The second point to notice is that the two WAN ports can be configured independently for different line rates ($n \times 64$ kbps). In our example, we are configuring both for the same line rate of 31 DS0 time slots because we don't want one of them to become a bottleneck.

Table contains the configurable parameters and their values for both WAN ports.

Table 1. Configurable parameters - WAN Ports 1 & 2

Parameter	WAN Port 1 value	WAN Port 2 value
Time Slot Select	1-31 Payload Rate: 1984 kbps	1-3 Payload Rate: 1984 kbps
Line Options	Channelized E1 (G.703/G.704)	Channelized E1 (G.703/g.704)
Code Sel	HDB3	HDB3
Line Build Out	120 Ohm	120 Ohm
Clocking Mode	Receive Clock	n/a
Idles Codes	Enabled	Enabled
Power Down	Normal	Normal

WAN Port 1 configuration

Following the hyperlink path to access WAN port 1's E1 configuration web page. Menu --> WAN Port1 --> Configuration. Using the values from [table 1](#) for WAN Port 1, configure the E1 port as in [figure 2](#). Click the Create button to enable all the new parameter values.

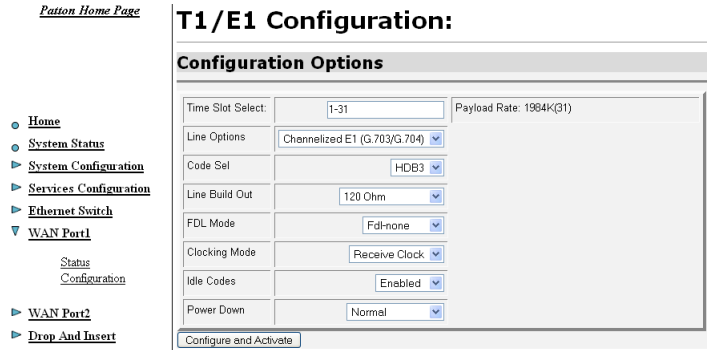


Figure 2. Configuration of WAN Port 1

Click on the Status hyperlink in the 2620 Configuration Menu to view any alarms. If it appears as figure 3, the most probable cause is no E1 connection to WAN Port 1.

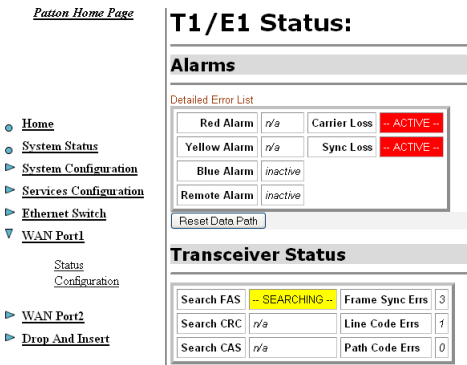


Figure 3. Status of WAN Port 1 configured but not connected

Connect a valid E1 line to WAN Port 1 on the rear of the 2620/KK, and refresh the Status web page. If the configuration matches the E1 parameters from the service provider, the alarms will cease, as in figure 4.

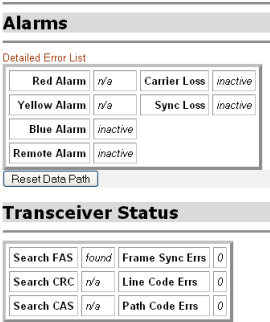


Figure 4. Connected E1 ro WAN Port 1

WAN Port 2 configuration

Following the hyperlink path to access WAN port 2's E1 configuration web page. Menu --> WAN Port2 --> Configuration. Using the values from table 1 for WAN Port 2, configure the E1 port as in figure 5. Click the Create button to enable all the new parameter values.

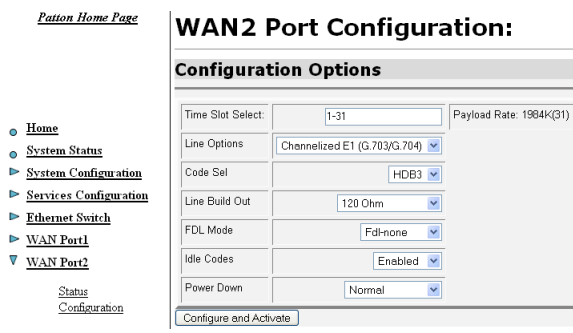


Figure 5. Configuration of WAN Port 2

You can view the Status web page for WAN Port 2 as you did earlier for WAN Port 1.

Now that the Physical Layer (1) has been configured, we will move to the Datalink Layer (2).

Configure the Routed PPP WAN Service for WAN Port 1

Consult the application diagram, [figure 1](#), again. The next step is to establish a functional routed PPP link between WAN Port 1 and the upstream route which is shown as the service provider. To look at the details of the configuration for a better understanding, see [figure 6](#). Notice that this routed PPP WAN service is in a different subnet than either the Ethernet or other WAN port and is called subnet 1 in [figure 1](#). The subnet on WAN port 1 is 192.168.1.0/24. You need the IP address of the service provider's upstream router to configure for the WAN gateway IP address. In this example, the upstream router's IP address is 192.168.1.1/24.

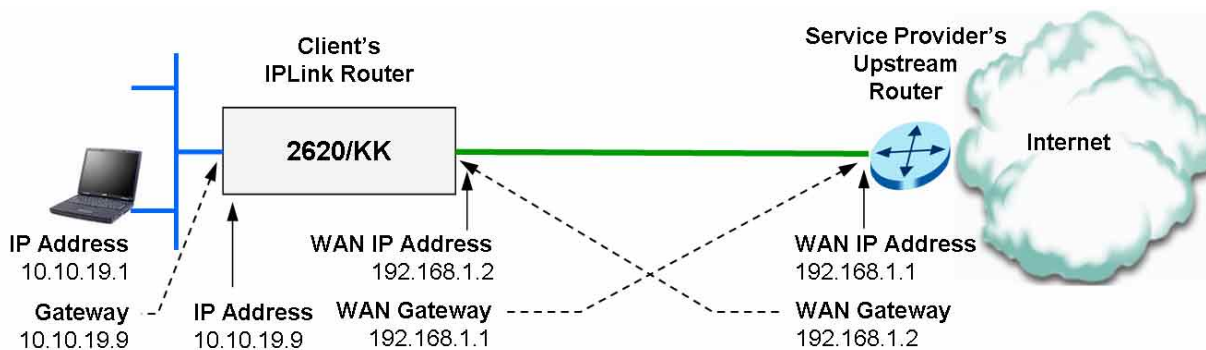


Figure 6. WAN Port 1 - Routed PPP details

Go to the configuration web page for creating a routed PPP connection by following this hyperlink path on the 2620/KK IPLink's web pages.

2620 Configuration Menu -> Services Configuration -> WAN -> *Create a new service...* -> PPP routed and click on the Continue button. You should see a configuration page as in [figure 7](#). Enter the values in the various fields and click on the Create button.

Description: wan1-ppp-rtd (you can choose your own description)

Interface: 1

WAN IP address: 0.0.0.0 255.255.255.255

Physical Port: wan1 (

LLC header mode: off

HDLC header mode: on

No authentication (and leave the User name and Password fields blank).

It should look identical to the web page in [figure 7](#).

WAN connection: PPP routed

Description:	<input type="text" value="wan1-ppp-rtd"/>
Interface:	<input type="text" value="1"/>
WAN IP address:	<input type="text" value="0.0.0.0"/> <input type="text" value="255.255.255.255"/>
Physical Port:	<input type="text" value="wan1"/>
LLC header mode:	<input type="text" value="off"/>
HDLC header mode:	<input type="text" value="on"/>
	<input checked="" type="radio"/> No authentication
	<input type="radio"/> PAP
	<input type="radio"/> CHAP or PAP
User name:	<input type="text"/>
Password:	<input type="text"/>
<input type="button" value="Create"/>	

Figure 7. WAN Port 1 PPP Routed configuration

From the “WAN connections” web page, click on the *Edit...* for this WAN service. You now see the “Edit Network Connection” webpage with numerous hyperlinks. Click on *Edit Ip Interface*”, enter these values and click on the Create button.

Ipaddr: 192.168.1.2

Mask: 255.255.255.255

Dhcp: false (disabled)

MTU: 1500

Name: ppp-0 (already assigned to the WAN service upon creation)

Enabled: true

The web page should appear as [figure 8](#).

[Edit 'Ip Interface'](#) [Edit 'Tcp Mss Clamp'](#)

Edit Ip Interface

Options

Name	Value
Ipaddr:	<input type="text" value="192.168.1.2"/>
Mask:	<input type="text" value="255.255.255.255"/>
Dhcp:	<input type="button" value="false"/>
MTU:	<input type="text" value="1500"/>
Name:	ppp-0
Enabled:	<input type="button" value="true"/>
Layer2Session:	

Figure 8. Assigning the IP address to WAN Port 1 on PPP Routed link

The last configuration item for the routed PPP routed link is the WAN IP address, which is the remote IP address of the upstream router. Click on *“Edit PPP”*, then click on *“View advanced attributes...”* and enter the IP addresses in the *“Remote Ip:”* and *“Local Ip:”* fields as in [figure 9](#). Click on the Create button.

[Edit 'PPP'](#) [Edit 'Hdlc Channel'](#)

Interface ID:	<input type="text" value="1"/>
Remote Ip:	<input type="text" value="192.168.1.1"/>
Local Ip:	<input type="text" value="192.168.1.2"/>

Figure 9. Configuring IP addresses for local and remote ends of routed PPP link

Assuming that you have connected the WAN Port 1 to the E1 line, the routed PPP session should come up. When it is *“UP”* and also ready for data transfer, the web page appears as in [figure 10](#). To reach it, click on the *“Edit PPP”* link, scroll down to see the **Summary** and **Connect state** fields. Notice that the Summary indicates *“Open for IP”*. Not only is the PPP link officially *“UP,”* but it has also negotiated the Network Control Protocol (NCP) which is necessary for data transfer. The Connect State is *“connected.”*

[Edit 'Service'](#) [Edit 'PPP'](#)

Lcp Echo Every:	<input type="text" value="10"/>
Auto Connect:	<input type="button" value="false"/>
Idle Timeout:	<input type="text" value="0"/>
Bcp Tagged Frame:	<input type="button" value="Not Enforced"/>
Summary:	open for IP, sent 207, received 206
Connect State:	connected
Uptime:	992
IdleTime:	0
NCPRemote Addr:	192.168.1.1
Version:	1.04
If In Octets:	3272
If Out Octets:	3280
If In Errors:	0
If Out Errors:	0
Packets Sent:	207
Good Packets:	206

Figure 10. Routed PPP link up and transferring data

All that remains is to create a route for the routing table, and the routed PPP WAN service should be fully operational--at least from this end of the link.

Configuring the Routing Table

Under the “Services Configuration” menu item, click on “IP routes.” In the main window, click on the “*Create new Ip V4Route...*” for adding routes in general. At this point in the configuration, we are setting the default route. As in typical default routes, the destination is 0.0.0.0 with a netmask of 0.0.0.0, since it is the last resort route--if no other routes define the port for routing an IP packet, send it to the port indicated by the default route. In our example, the default routed port is the IP address of WAN port 1, 192.168.2. The interface is ppp-0. See [figure 11](#) for the correct configuration of the default route.

Edit - Advanced Settings

Name	Value
Destination	<input type="text" value="0.0.0.0"/>
Gateway	<input type="text" value="192.168.1.2"/>
Netmask	<input type="text" value="0.0.0.0"/>
Cost	<input type="text" value="1"/>
Interface	<input type="text" value="ppp-0"/>

Figure 11. Adding Gateway address to routing table

Click on the *IP routes* hyperlink in the Configuration Menu. If the route is properly entered, a green check mark is under the **Valid** column. See [figure 12](#) as an example.

Edit Routes

Existing Routes				
Valid	Destination	Gateway	Netmask	Delete?
✓	<input type="text" value="0.0.0.0"/>	<input type="text" value="192.168.1.2"/>	<input type="text" value="0.0.0.0"/>	<input type="checkbox"/>

[Advanced Options...](#)

Figure 12. Indication of a valid route

Configure WAN Port 2 for Bridged PPP WAN Service

Configuring the bridged PPP WAN service for the second T1/E1 port is much simpler than the preceding routed PPP configuration. Click on *Create a new service...* link on the WAN Connections page to select “PPP Bridged.” [figure 13](#) shows the values for each configurable parameter. Creating a Description is necessary for the IPLink to build a WAN service. The most critical parameters are the Interface and Physical Port fields, which are “2” and “wan2”, respectively. Click the Create button after entering all the values as in [figure 13](#).

WAN connection: PPP bridged

The screenshot shows a configuration form for a WAN connection. The fields are as follows:

Description:	wan-2-ppp-brdgd
Interface:	2
Physical Port:	wan2
LLC header mode:	dialout
LLC header mode:	off
HDLC header mode:	on
Authentication:	<input checked="" type="radio"/> No authentication <input type="radio"/> PAP <input type="radio"/> CHAP or PAP
User name:	
Password:	
<input type="button" value="Create"/>	

Figure 13. WAN Port 2 - Configuring the bridged PPP link

After completing this configuration, click on the “*Edit PPP*” link to see if the link status. A proper configuration and E1 link to WAN Port 2 should yield a valid bridged PPP link. In [figure 14](#) the Summary states “open for MAC” followed by the number of sent and received octets. Due to being a bridged PPP link, the link is not “open for IP”, but “open for MAC”, the unit of encapsulation for bridges. The link has fully connected.

The screenshot shows the status page for the PPP link. It includes a table with the following data:

Edit 'Service'		Edit 'PPP'	
Summary:	open for MAC, sent 545, received 36		
Connect State:	connected		
Uptime:	150		
Idletime:	0		
NCPRemote Addr:			
Version:	1.04		
If In Octets:	592		
If Out Octets:	49428		
If In Errors:	0		
If Out Errors:	0		
Packets Sent:	545		
Good Packets:	37		
Reset Counters:	<input type="text" value="0"/>		
Version:	1.01		
Enabled:	<input checked="" type="checkbox"/>		
Termination:			
<input type="button" value="Create"/> <input type="button" value="Reset"/>			

Figure 14. Bridged PPP link up and running

Test the connection

1. The first tests of the PPP connections are for successful pings to the IP address of WAN Port 1's IP address. Since the bridged PPP connection does not have a uniquely assigned IP address, the test is to ping the IP address on the remote end of the bridged PPP connection.
2. If the ping fails, the first check is with the physical layer. If the physical layer is not operating correctly, there is no hope of layer two protocols (PPP) to function.
 - Verify that the E1 links are operating properly with no alarms or errors. If there are alarms or errors, they must be resolved before any success can be expected for the PPP links.

- For the physical links to be free of alarms and errors, the minimum parameters must match those of the provider's E1 configuration-number of time slots, clear channel or structured E1, line coding, termination impedance which is 75 Ohms for coaxial and 120 Ohms for twisted pair physical media.
3. Once the physical layer is up, the next checks apply to the Datalink layer, layer 2. Look at the Summary and Connect State information on the *IEdit 'PPP'* page.
 - If it is not connected, determine whether the link is in the process of connecting or dead. If dead, the remote end may be causing a problem. If it is trying to connect without success, it may be a synchronization problem which may be caused by an error in the clocking mode of the E1 configuration. Rarely should you need to change the other parameters. In fact, it is best not to change parameters like LCP Max Configure, LCP Max Failure, and LCP Max Terminate. Any changes to these parameters can cause erratic and unreliable connections.
 4. If the PPP link is UP and connected, you may not be able to transfer data from an ill-configured routing table. Be aware of the ping's response to the attempted ping. The messages "Request timed out" and "host destination not available" indicate different routing problems. Hence the importance to understand their meaning and where in the routed path, the ping is failing.
 5. You can also issue a ping or traceroute command from the IPLink. Under the System Configuration menu, click on the Tools link for issuing Pings and Traceroute commands from the IPLink.

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Worksheet for implementing this application

This is a compilation of the key parameters for designing this application. Fill in the values and the configuration is simplified and, more importantly, less likely to have an error. Refer to [figure 1](#), particularly to identify the referenced subnet, that is, 1, 2, or 3.

Table 2. Dual Routed Application Worksheet

	Upstream Router	WAN Port 1	2620/KK WAN Port 2	Ethernet
Channelized E1				
Line Coding				n/a
Impedance-120 or 75 Ohms				n/a
Clocking	Master	Receive	Not configurable	n/a
Time Slots				n/a
WAN Service	(Subnet 3)	(Subnet 1)	(Subnet 2)	(Subnet 2)
PPP-Routed or Bridged				n/a
Interface	n/a	1	2	n/a
Local IP address				
Subnet mask				
Remote IP address	n/a	Of the upstream router		n/a
Subnet mask	n/a	Of the upstream router		n/a
Authentication				n/a
Gateway	n/a			IP address/mask of WAN port 1