Port Forwarding & Case Study

Introduction

TalkTalk's responsibility lies with ensuring that this facility works on their routers, they cannot be held responsible for you devices that you are trying to forward to.

This document not only deals with how to configure port forwarding on most of the TalkTalk routers, but also deals with the end to end solution. A lot of of problems in this area are not the actual router configuration, but lay with the device on the local network that the ports are being forwarded to. These can be:-

- application problems,
- personal firewall problems,
- or ports that need to be translated to other ports. An example of this is if you try to forward port 80, the first “device” to see this & react to it is the web server within your router.
- how the scenario is being tested.

Note: you will not be able to test, or use port forwarding from a device on your network making a connection to your WAN IP address, or DDNS URL. If you did, the connection attempt would be routed out to the internet and back in again to your router. Once it comes back into your router again, it will not be forwarded to the device your port mapping rules state, but will be blocked by the router. This is known as “Loop back” traffic, which most routers will discard those packets as an additional security measure.

If you have a Smartphone temporarily disable the WiFi and turn on Mobile Data, which will enable you to test access to the device via your mobile phone network.

Basic order of work required

1. Add the port forwarding rule(s) to the router
2. Reboot the router
3. Add the required inbound rule(s) to the firewall
4. Launch the application
5. Test it locally from another device connected to your router's network (i.e. a device with a 192.168.1.x address)
6. Test it with http://portchecker.co/check you will have to run it once for each port you are trying to use. and only go to step 7, if it reports ALL of the ports you have forwarded as OPEN.
7. Test using other people on the internet

Please see the next page for the main sections covered in this document.

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Sections in this document

The case study is an example nothing more. It covers using an FTP server, your scenario (e.g. NAS Server, CCTV, games server etc) is unlikely to be using this.

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Case Study

Please note ***this is just an example of the steps you might need to go through to get your end to end solution working***. Unless you are trying to get an FTP Server running on a PC connected to your local network, ***then please just treat this as an example, but your solution will differ from this.***

This case study looks not only at port forwarding, but applications on the local PC that require the port forwarding, plus adding rules to the firewall that runs locally on that PC. It also deals with how to test this (crucially from the internet, as well as locally on your router's network).

Test setup

FTP server running on Windows 7 Home Premium (SP1) : FileZilla Server V0.9.45
FTP client running on Android V2.3.6 : FTPCafe FTP client

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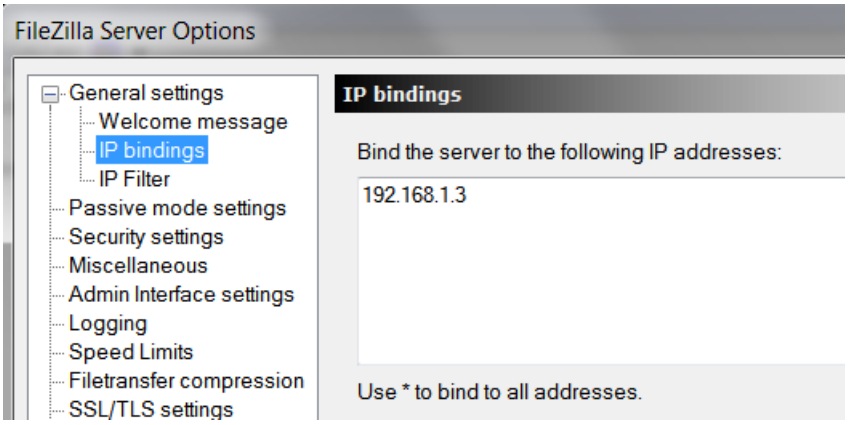
FTP Server Settings



Set up a User account & password plus a home directory.

Active or Passive FTP mode

The control of the FTP transfer is always done using TCP port 21, the port used to carry the data transfer varies on the FTP mode used. There are two modes used to transfer the data from the server to the client, active or passive mode.

Active mode always uses TCP port 20 and the data transfer session is initiated by the server to the client. The client requests active mode by sending the PORT command to the server. It will tell the server to start a session to the IP address & TCP port, that it gives the server. This will therefore be initiated from the PC and will automatically be allowed through its firewall. It will still need some port forwarding for the traffic from the client to the server, but as it is a static port, this is not a problem.

If the client on the other hand sends a PASV command to request passive mode, the server if it accepts this, will instruct the client to establish a new session to the required IP address & TCP port number. This port number is dynamically assigned & will be greater than 1024. This mode is regarded as more secure than active mode, but unless the router's port forwarding responded in a dynamic fashion, it will fail at this point.

From my tests the HG523a will allow passive FTP mode transfers to pass through it correctly, even though the FTP-DATA session is initiated from the client over the internet.

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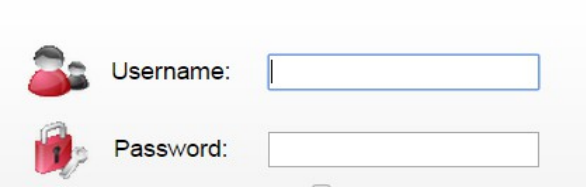
Router login

To do this work, you will need to log in to your router. To do this browse to your router at:-

http://192.168.1.1

At the prompt:-



Enter your admin username & password. Unless you have changed this, the default is normally:-

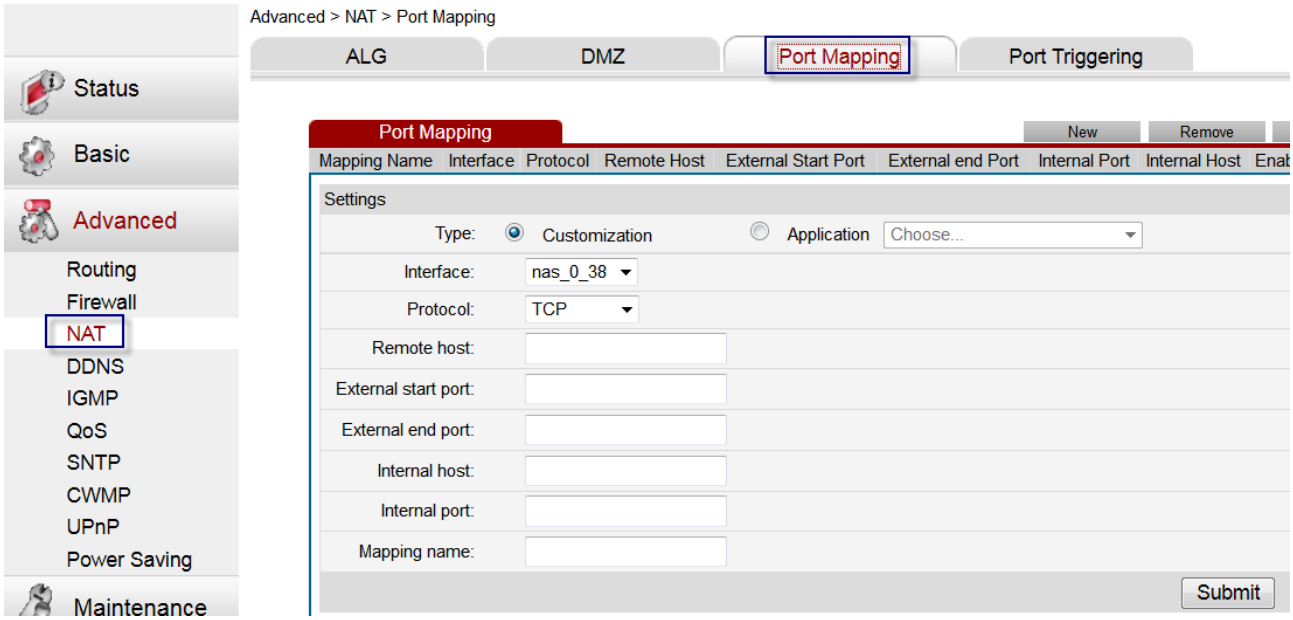
Username : admin
password : admin

Port Forwarding & Case Study

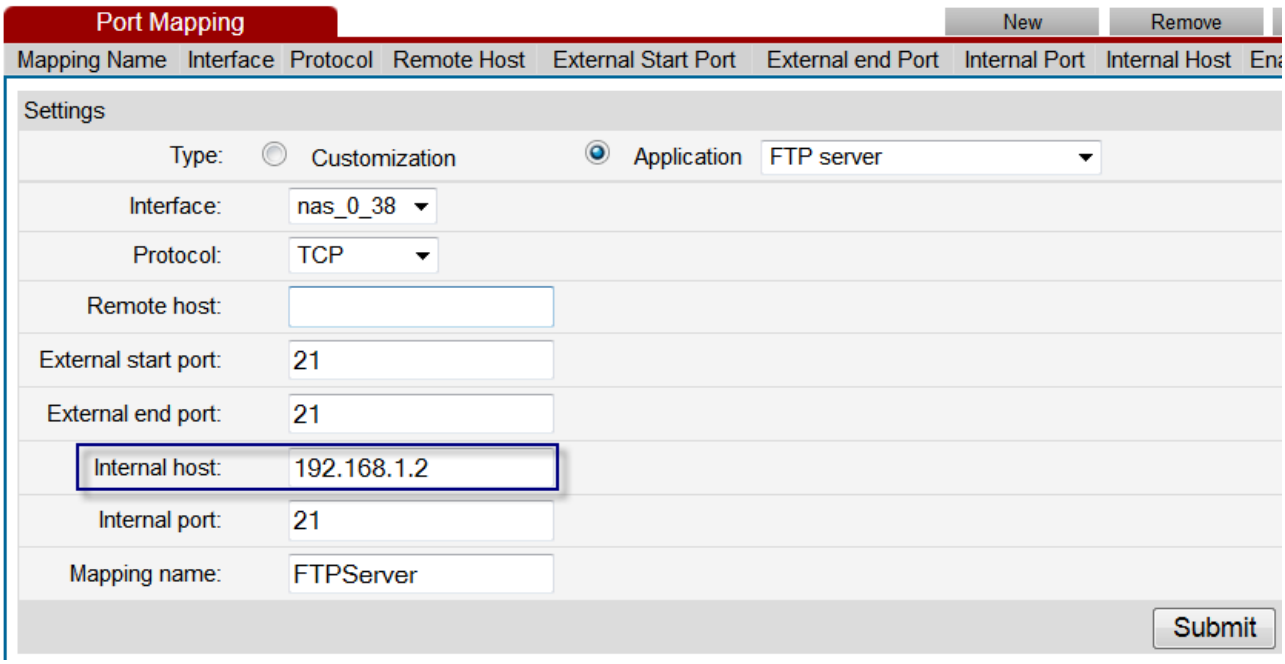
Port Forwarding on Huawei routers (& some DSL-3780s)

Log in to the router & go into advanced mode. From there go to:-

Advanced > NAT > Port Mapping



Either select an existing "Application", or use the "Customization" option. In this case the FTP Server application can be used, but the IP address (maybe 192.168.1.2) for the device hosting the FTP server will need to be added in the "Internal host" field:-



If both external start & end ports are left at 21 this will work in passive mode OK.

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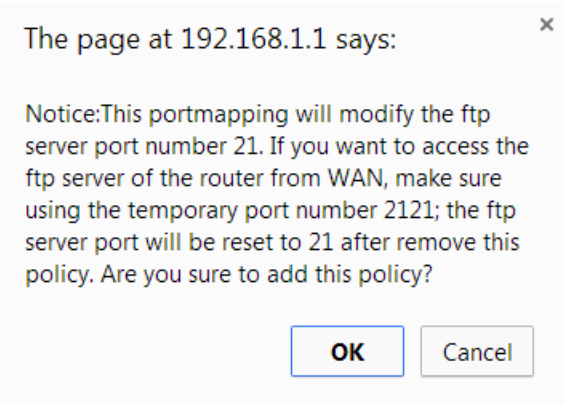
Note when adding this forwarding rule you will see this box:-



Click OK to that.

Click “Submit” & reboot the router.

For all other routers, please see this section.

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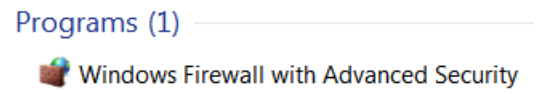
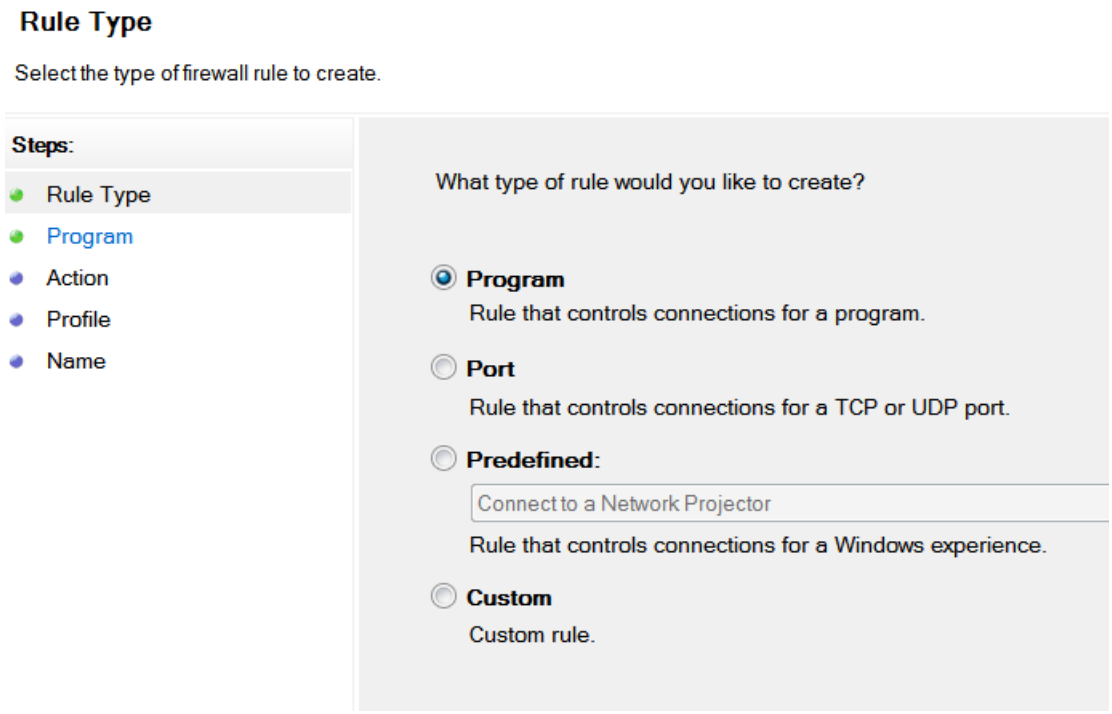
Windows Firewall settings

The screenshots come from Windows 7, but the procedure almost identical on later versions of Windows.

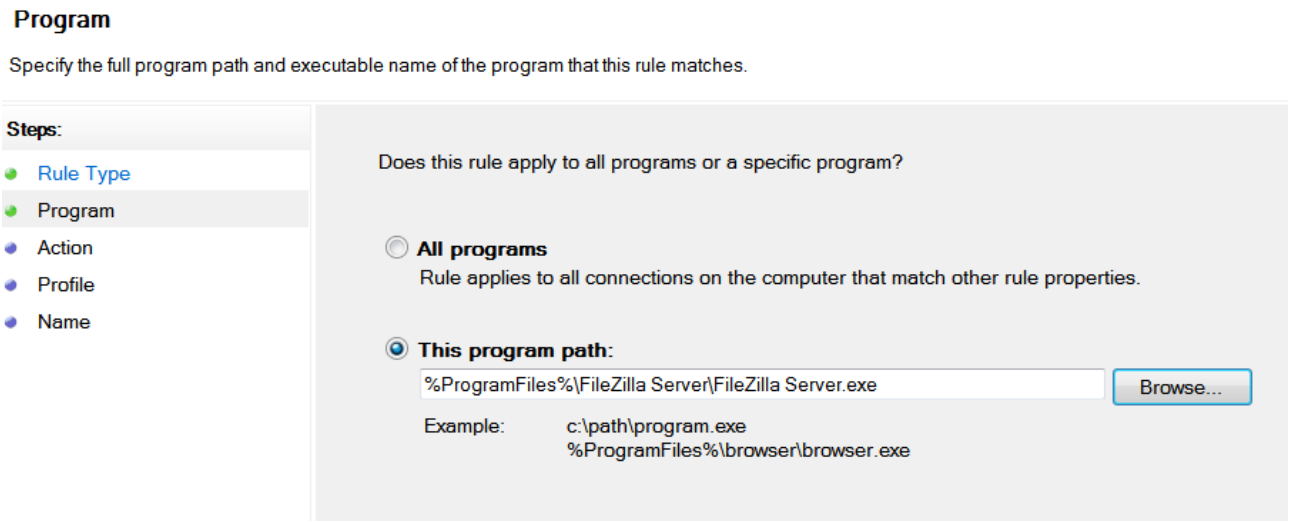
Go to:-



Create a new inbound rule:-



Click “Next” in the above screen, then on this next screen browse to the program's executable file. In the case of the FileZilla Server, allow the server application (not the interface to the server):-



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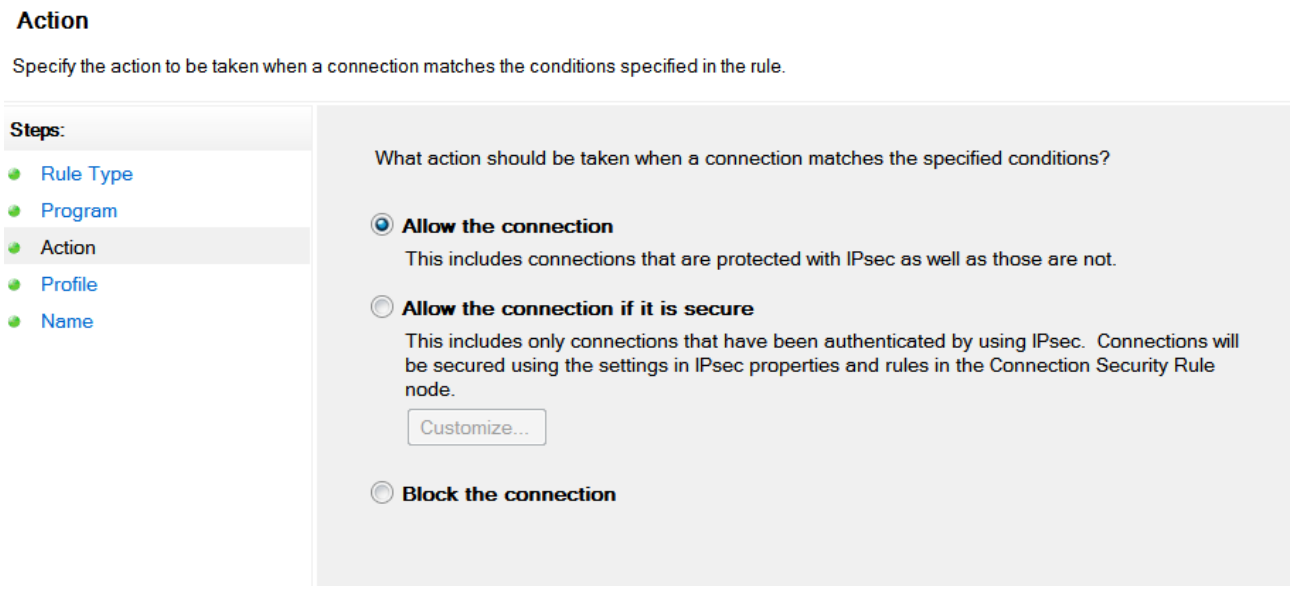
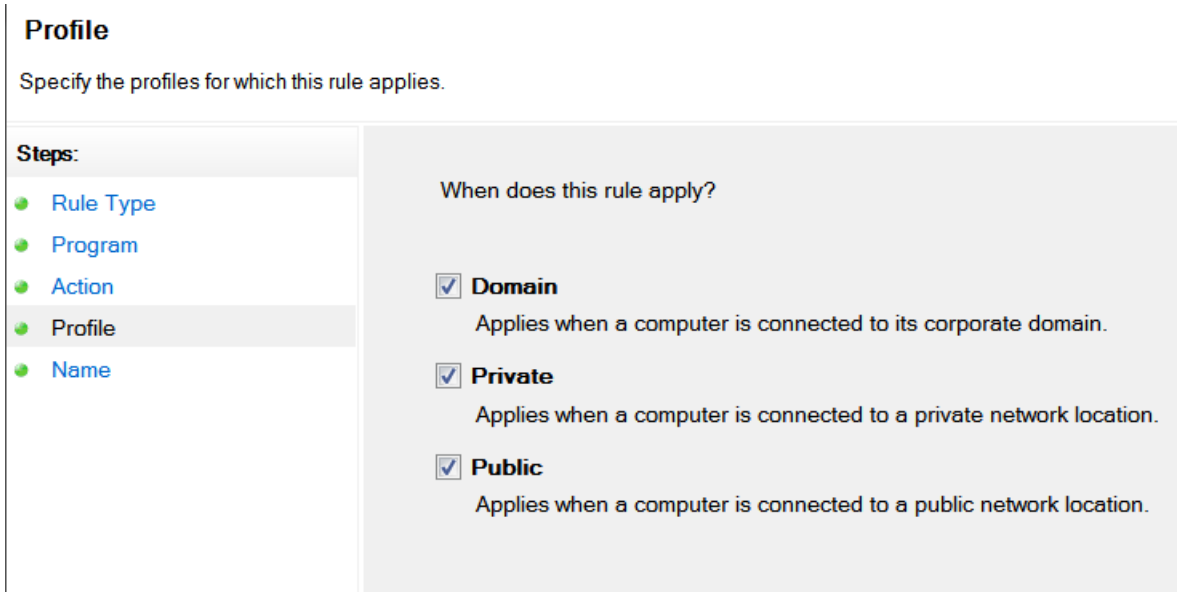
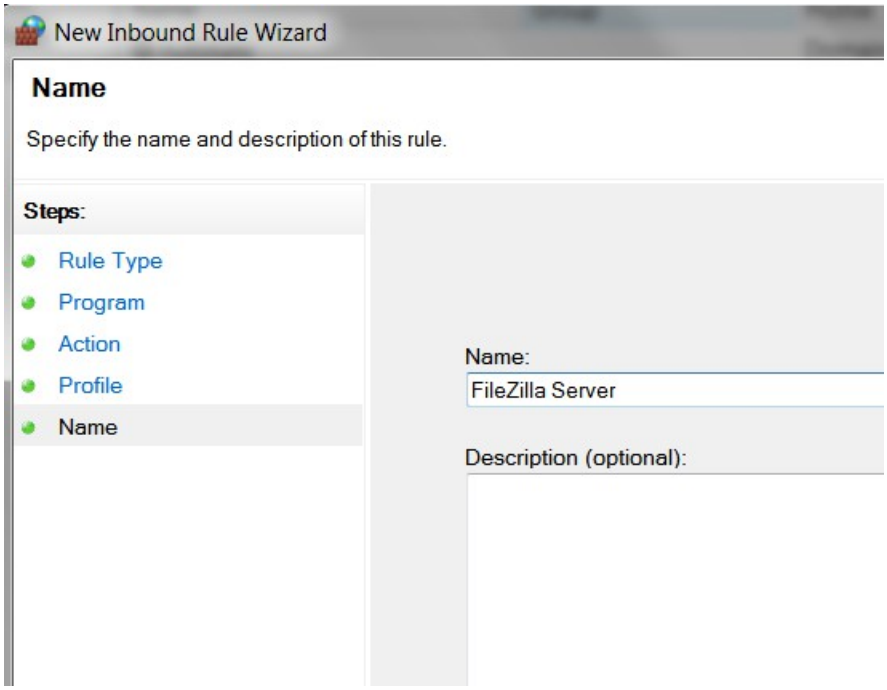
Click Next, then on this screen tick “Allow connection”:-



Then click next and on the next screen set as appropriate:-



Click “Next” again, give it a unique name & click “Complete”:-



It will now be displayed in the list of inbound rules under the name you allocated to it.

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Test Locally

The next thing is to test that the client when connected to the same subnet can access the FTP Server on 192.168.1.3 and download a file. If all is OK, then setup the port forwarding on the router.

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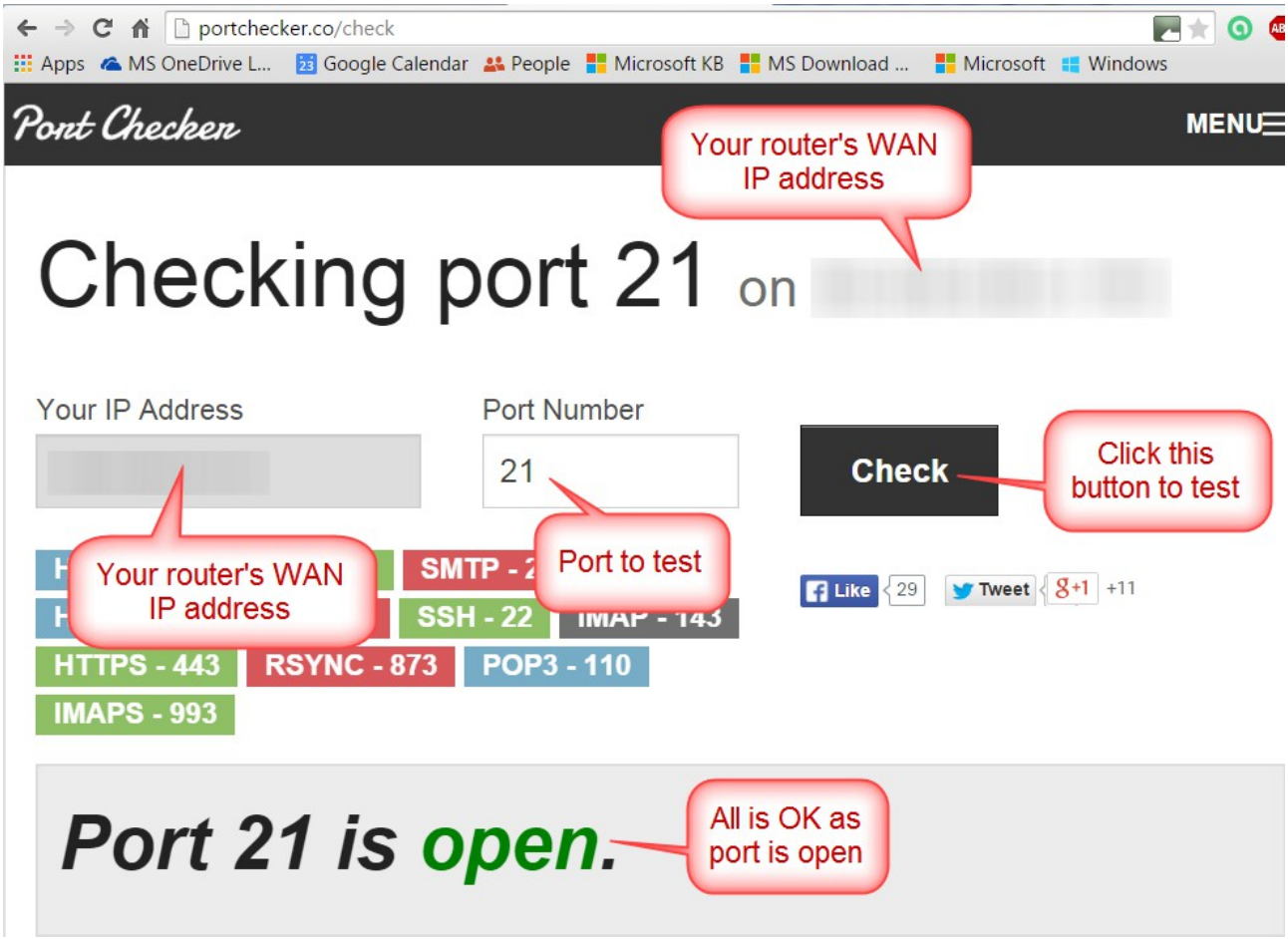
Testing from internet

Note: when testing, you must have your server software running (e.g. FTP or Minecraft server software etc). ***Otherwise the port will always be closed***.

There is a website that can target your WAN IP address automatically & allow you to specify a port to check. It will report if it is open or closed. This should prove both your forwarding rule & your inbound rule within the firewall on your PC. This site is:-

http://portchecker.co/check

When you visit it from a device connected to your router (wired or wi-fi), it will populate the form with your router's WAN IP address & port 80. Change the port number to the one you want to test & click the "Check" button. The example below when the FTP server forwarding rule was working correctly:-



Once that is OK finally test from a PC or phone that is not connected to your router's network (wired or wireless), but has access to the internet from another broadband connection or 3G or 4G etc.

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Note: most routers do not allow 'Loop Back' access so you will need to access the device only from an external network when using the external internet address. You will not be able to access the external IP address from the internal IP address, when the external address is port forwarded to another local device. Most routers prevent 'Loop Back' as an additional security measure.

So if the device being forwarded to is 192.168.1.3 and the device making the test is 192.168.1.63, this device will not be able to make a test to the router's WAN IP address.

If you have a Smartphone temporarily disable the WiFi and turn on Mobile Data, which will enable you to test access to the device via your mobile phone network. Alternatively you could use a wireless hot spot.

As far as this case study is concerned an FTP client called "FTP Cafe" was run on an Android phone via the 3G network.

To test from a browser (if applicable) you must specify the port number e.g. port 81:-

http://92.92.92.1:81

DDNS

Dynamic DNS provides a domain (URL web address) for your router's WAN IP address to allow remote access to your broadband router's local network, particularly important if you use port forwarding. The problem is, if you try & access the router's network by the WAN IP address directly, this changes from time to time. DDNS keeps track of the current IP address and if you just use the domain supplied by your DDNS provider. The domain will update itself via the DDNS protocol, when the WAN IP address on the router changes.

So DDNS will help you remotely access devices connected to your local router's wired or wireless connections, this could be PCs, DVR, webcam, camera system etc. However, this will also require port forwarding to have been correctly configured on the router as well.

You will need to subscribe to a DDNS provider first. There are a number of free DDNS services available.

Note: not all DDNS providers work well with TalkTalk routers – No-IP being one of these. This is not a fault of NO-IP, but is down to the implementation of it on some routers.

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Port Translation (where a port is intercepted by the router, e.g. port 80)

If you have a PC for example, connected to your local network whose IP address is 192.168.1.100 which is hosting a webserver (this will use TCP port 80) and you want to access this from the internet, normal port forwarding will fail.

Your webserver is expecting an incoming connection on port 80.

So you make your connection attempt from the internet to:-

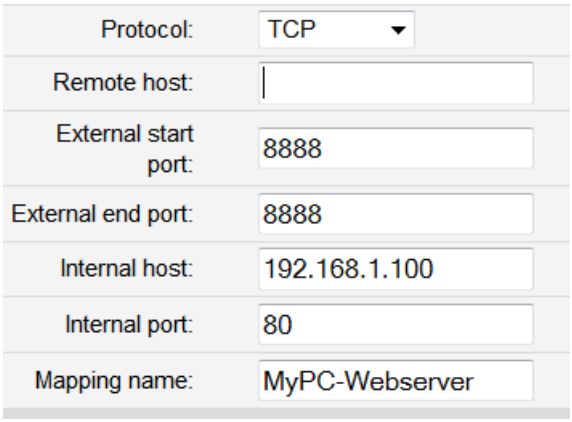
http://a.b.c.d

where a.b.c.d is the external or WAN IP address of the router.

The router's management system is also a webserver, so your connection attempt (as it is targeting port 80), will be intercepted by the router's webserver. This is why you might see the router's login screen & your connection never reaches the web server on your PC.

What you need to do is choose an unused TCP port number (for example port 8888), then create a new port forwarding rule and translate the external port 8888 to the internal port 80 (called PAT or Port Address Translation) and point this to the PC running the webserver.

What you need is a rule like this:-



Then from the internet try a browser connection to:-

http://a.b.c.d:8888

where again a.b.c.d is your router's WAN IP address or DDNS URL.

Note the colon character ":" that separates the IP address from the port number.

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Apple MACs running Windows applications

Apple MACs for sometime now have been able to run Windows applications via the “Parallels Desktop” software:-

http://www.parallels.com/uk/products/desktop/

There are problems running certain Windows applications (e.g. Minecraft server), because these applications may not open the ports correctly when using “Parallels”. This will mean that port forwarding might not work, unless this is done correctly.

Port Forwarding & Case Study

Port Forwarding on other routers

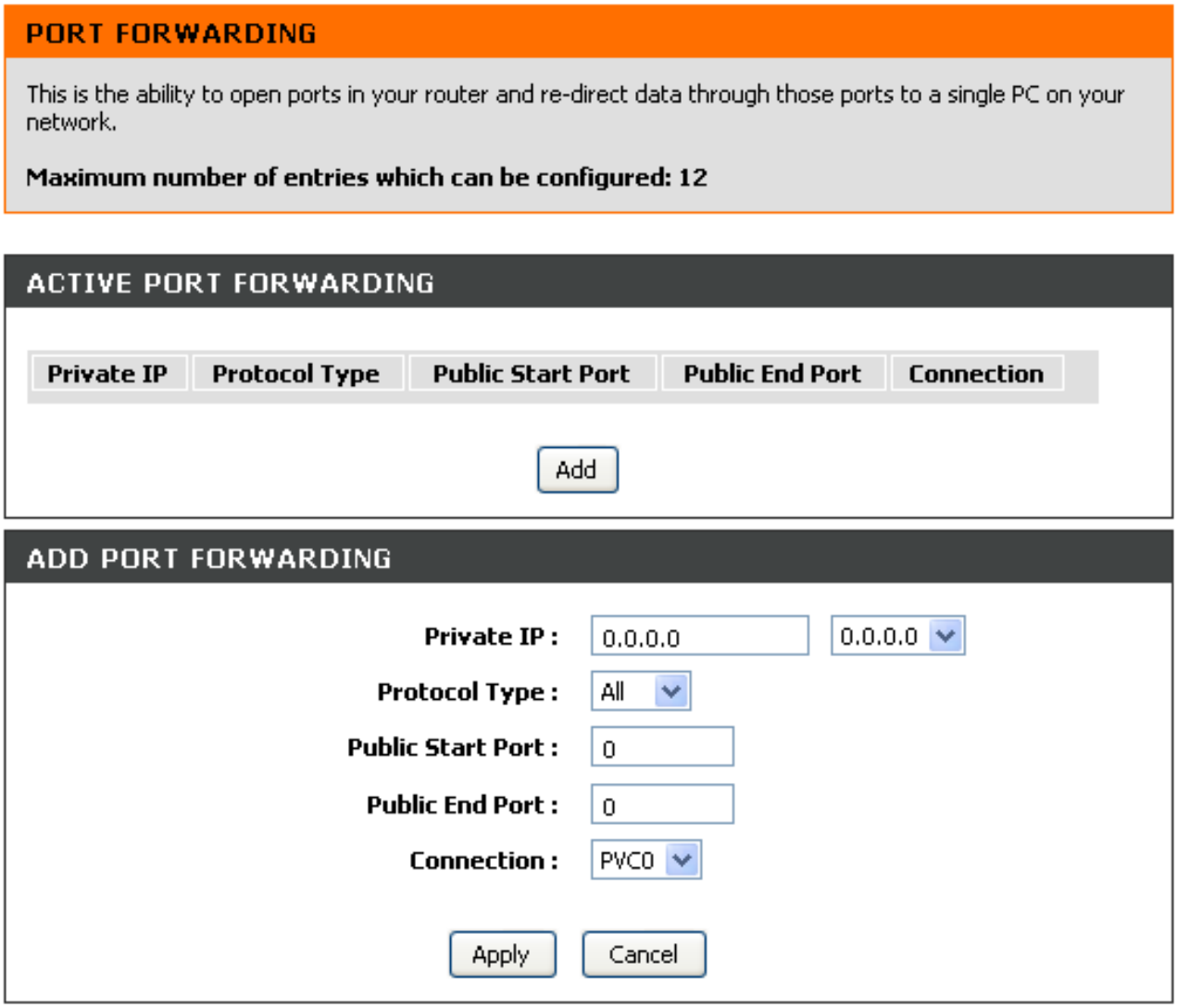
This will depend on the make & model of router that you have. The following are included in this guide. Once the PC firewall & port forwarding is all done, see the section on testing from the internet.

1. Huawei & some D-Link DSL-3780 variants – (used in this case study)
2. D-Link DSL routers (not DSL-3780)
3. D-Link DSL-3780 variants with D-Link style interface
4. Huawei HG633 & HG635 routers

Port Forwarding & Case Study

D-Link DSL routers (not DSL-3780)

Log in to the router, then click on the “Advanced tab at the top and “Port Forwarding” on the left:-



Try leaving the “Connection” as PVC0 but this could need changing to PVC1.

There is no need to make any firewall changes within the router.

Once the changes are complete, click “Apply” & then “Reboot” on the left.

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D-Link DSL-3780

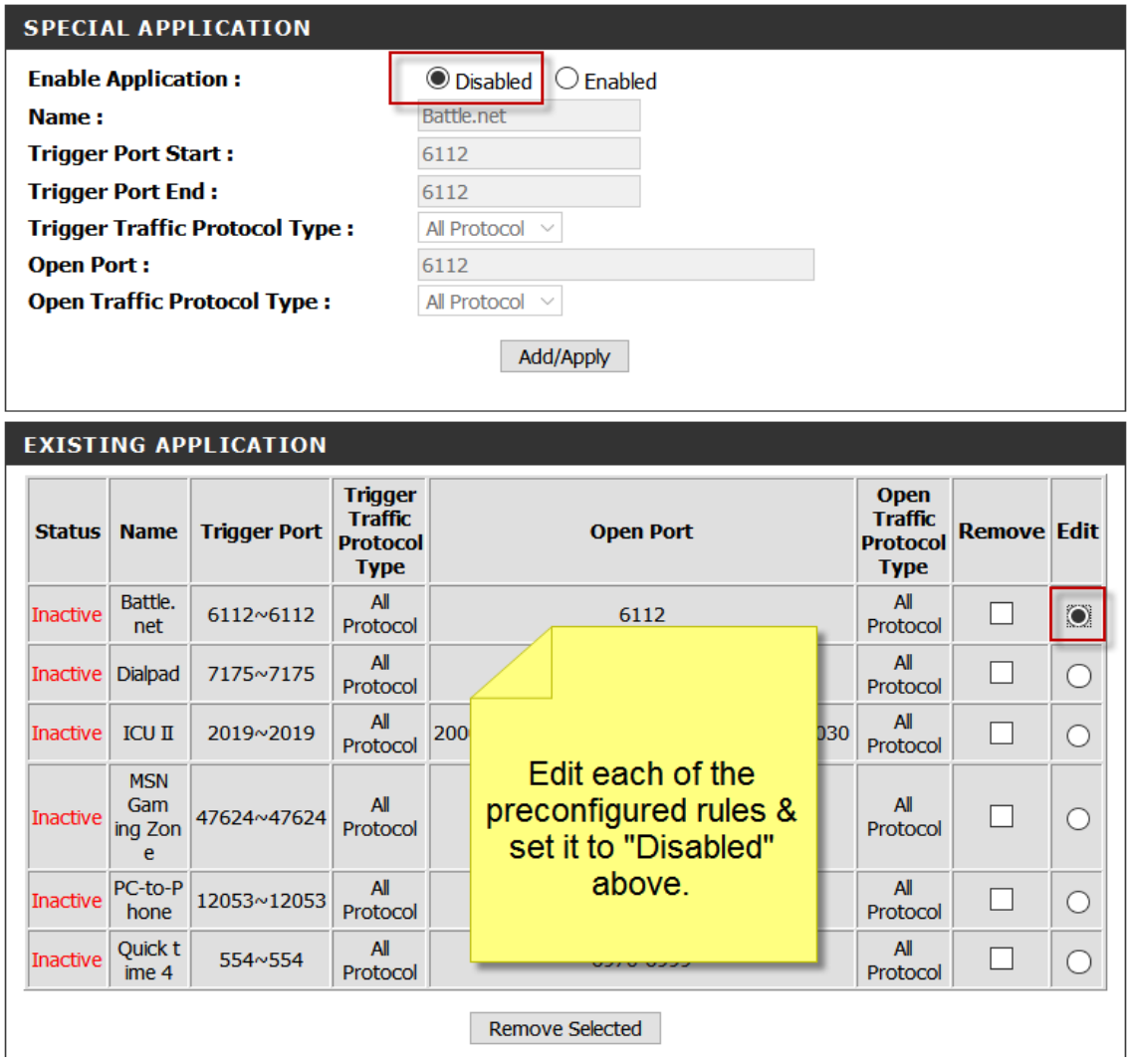
This is a bit of a weird router, in so much as some versions, once you get past the summary screens into "Advanced" mode have the Huawei "Look and feel" interface and some go into the more traditional D-Link interface. If your variant is of the "Huawei" interface and you should be able to follow my guidelines for Huawei routers.

However, the vast majority of the DSL-3780 routers though have the D-Link interface, with these the port forwarding is set up under "Virtual Servers".

There is also talk that you have to configure the "Applications" section as well, ***but this is wrong***.

If the "Applications" are configured under the "Special Application" section, ***this makes the port forwarding operation very intermittent***, often leaving the port closed when tested via various port testers such as http://portchecker.co/check.

Please also note that there are a number of these preconfigured in the router, unless you really need these I would disable them at the least. First need to log in to the router, then select the edit function & setting the "Special Application" section above it:-



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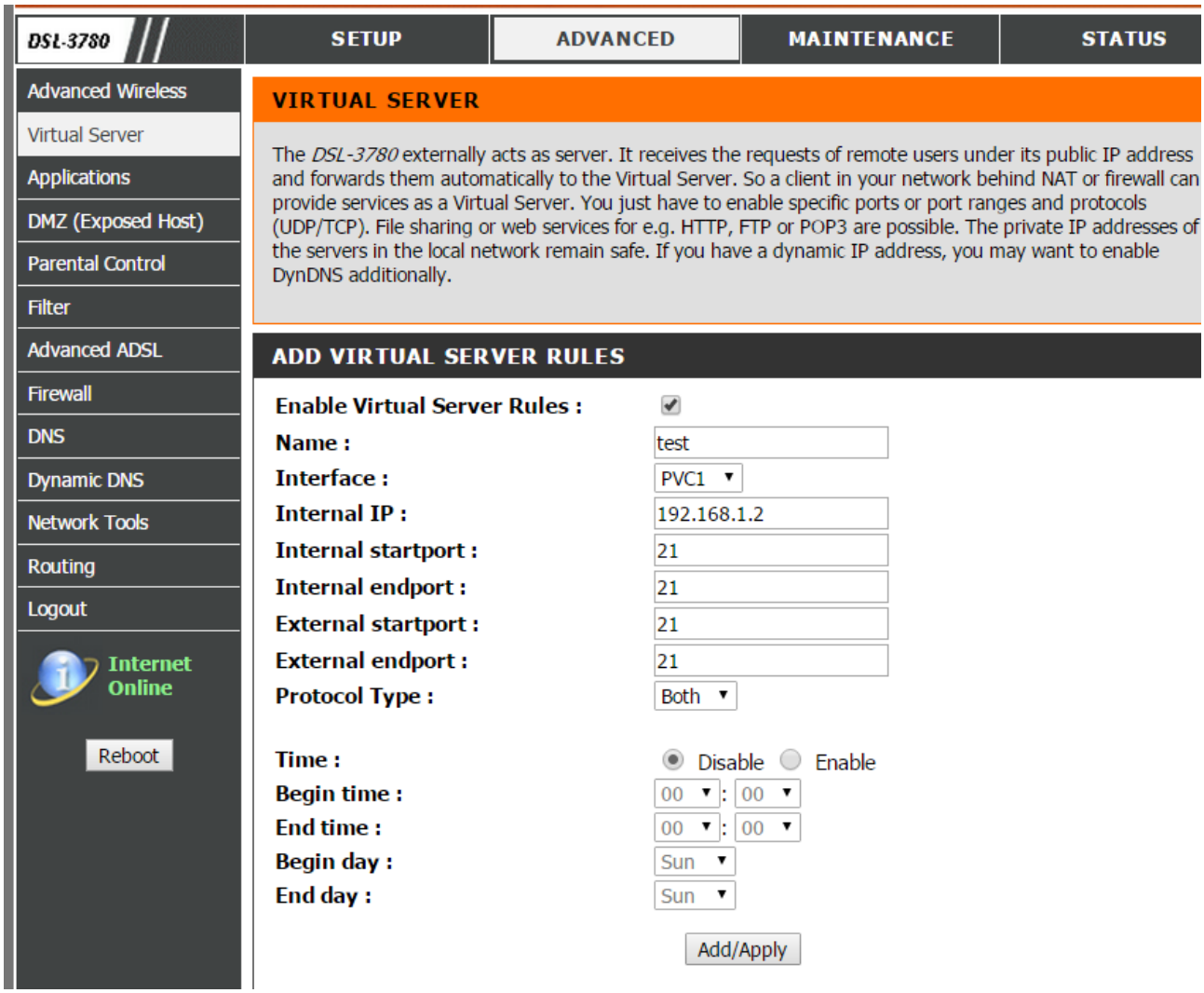
Virtual Servers

Follow these instructions below taking particular notice of the “interface” option. This should not be left as **WAN**, but change it to **PVC1**. You can replace the Internal IP/port number with whatever ones you need.

Click on the “Advanced” tab along the top and down the left hand side, click on “Virtual Servers”. The example below port forwards to an FTP server:-



Add the required rule & click the “Add/Apply” button.

Router reboot

If the router is rebooted at this point you may lose some of your settings, so go to:-

Maintenance > System Settings > Save & reboot the device:-

Port Forwarding & Case Study
Huawei HG633 & HG635 routers

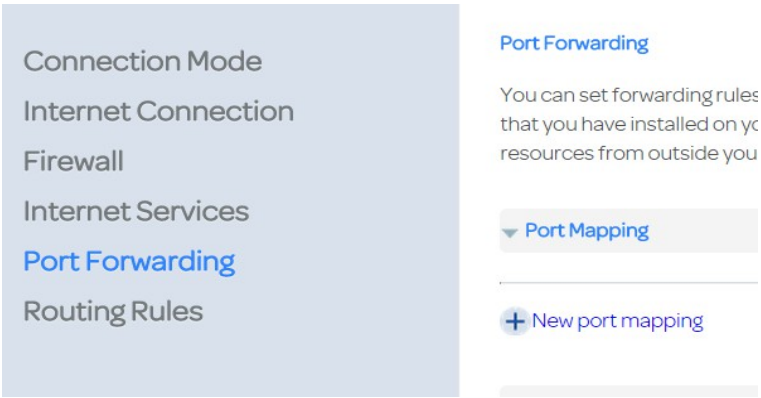
This is quite easy to setup on this router, but there are two concepts that are slightly different:-

- ***Applications*** – these can be software programs such as an FTP Server, or the Minecraft game in server mode that run on a PC/server. They can also be stand alone devices such as CCTV cameras, or a set top box for a TV installation.
- ***Internal Host*** - you do not forward to a device's IP address, but you forward to a LAN Device using its MAC address. This address stays constant, even if the IP address changes. So it works well with a DHCP (automatically assigned) allocated address.

Do not use Port Triggering, in line with most other routers, this renders the port mapping to be very intermittent at best & at worst the rule will not work at all.

Note: because these routers work on identifying the device by it's MAC address, beware of devices such as IP cameras, that might have both wired & wireless connections. Each connection type will have it's own MAC address. If you initially configure the camera with a wired connection to configure it's wireless connection, then make sure you set the port mapping rule to point to the ***wireless MAC address & not the wired connection's MAC address***.

There are two routes to the port mapping page, either via the "Internet" tab followed by "Port Forwarding" on the left:-



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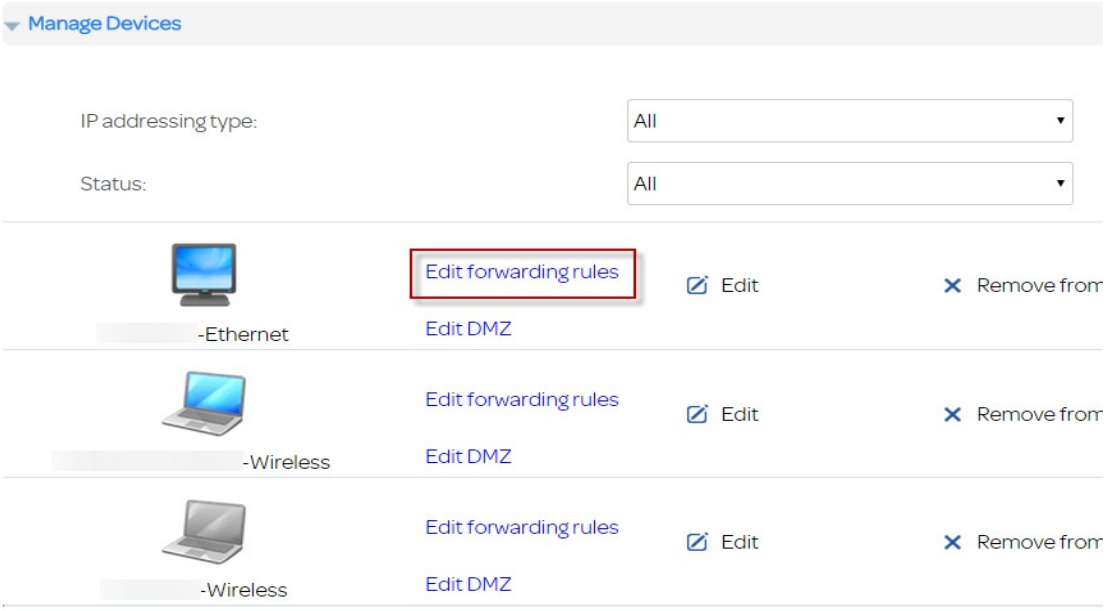
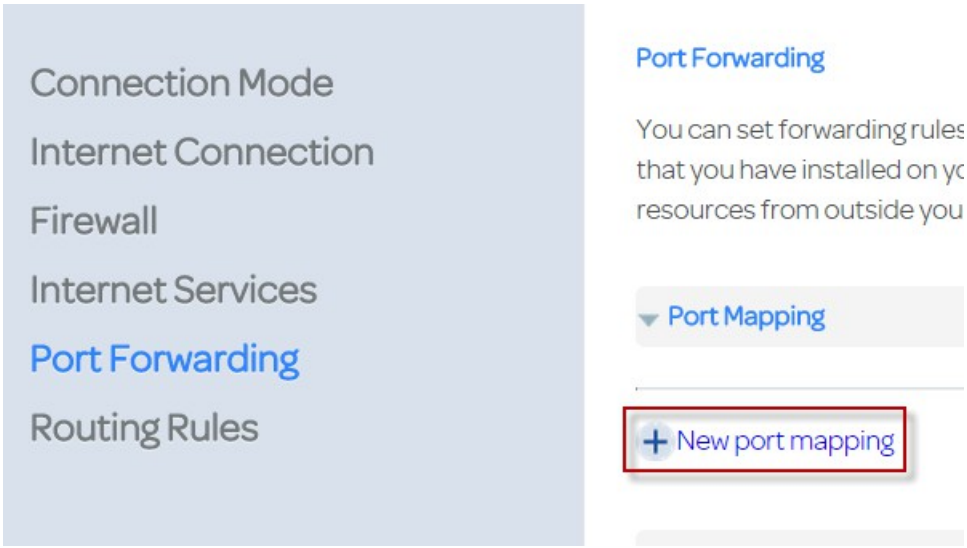
Alternatively click on "Home Network" and "LAN Devices" and click on one of the "Edit forwarding rules" links:-



Port Forwarding & Case Study

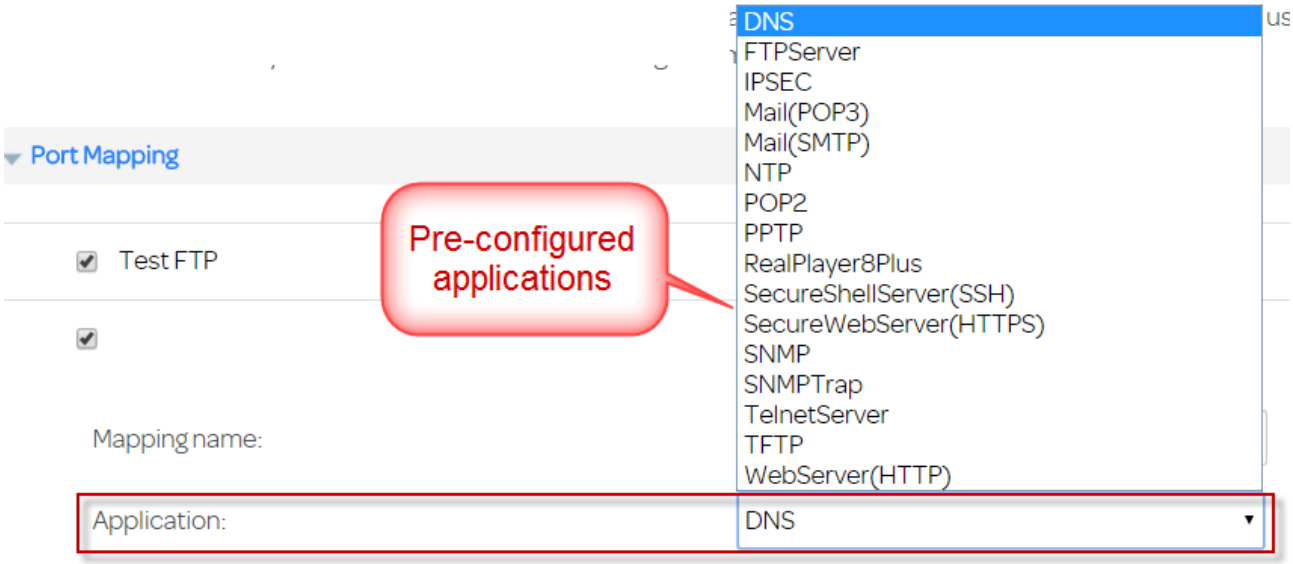
Applying port forwarding

Once in the "Port Forwarding" configuration area, click "New port mapping":-



The first concept here is to ensure there is an entry for you desired application that is running on the device that you want to forward to. This could be an FTP Server, SNMP Server etc. This contains all of the port numbers required.

There are a certain amount of these pre-configured, so click the "Application" dropdown box to see the options:-



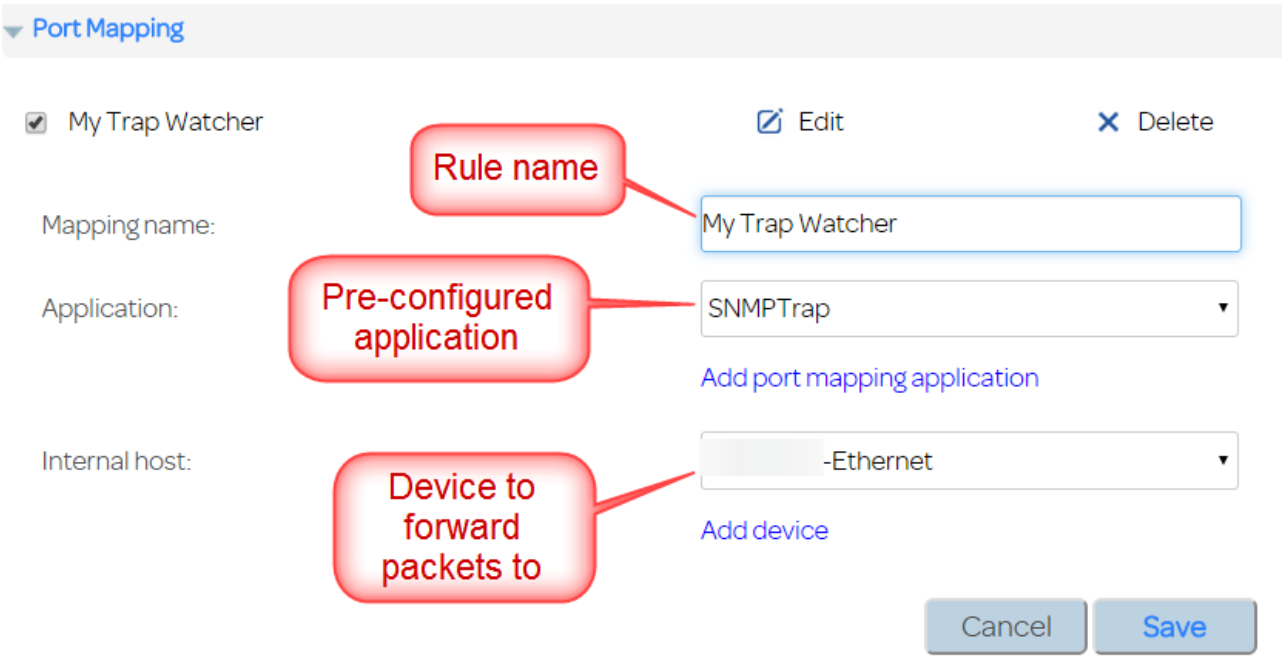
Port Forwarding & Case Study

So in its simplest form, the rule can be done very easily.

Supposing you need to forward SNMP Traps (don't worry what these are, it is only a very simple example) to a PC connected to a LAN port on the router. This is an easy example as there is already a pre-configured application for this.

All you have to do in this case is:-

1. Allocate a name for this port mapping rule
2. Select "SNMPTrap" from the "Application" dropdown box
3. Select the desired PC to forward the traffic to from the "Internal Host" dropdown box.
4. ***Reboot the router*** & job done!



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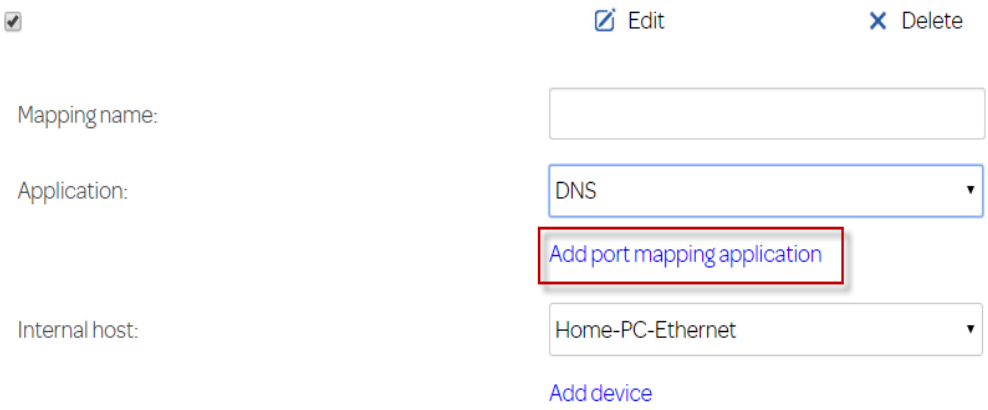
No suitable application available

In most cases there will be no suitable application existing in the "Application" dropdown box. This will require you to add your own application (e.g. Minecraft server, CCTV camera or DVR) to the port mapping application dropdown box.

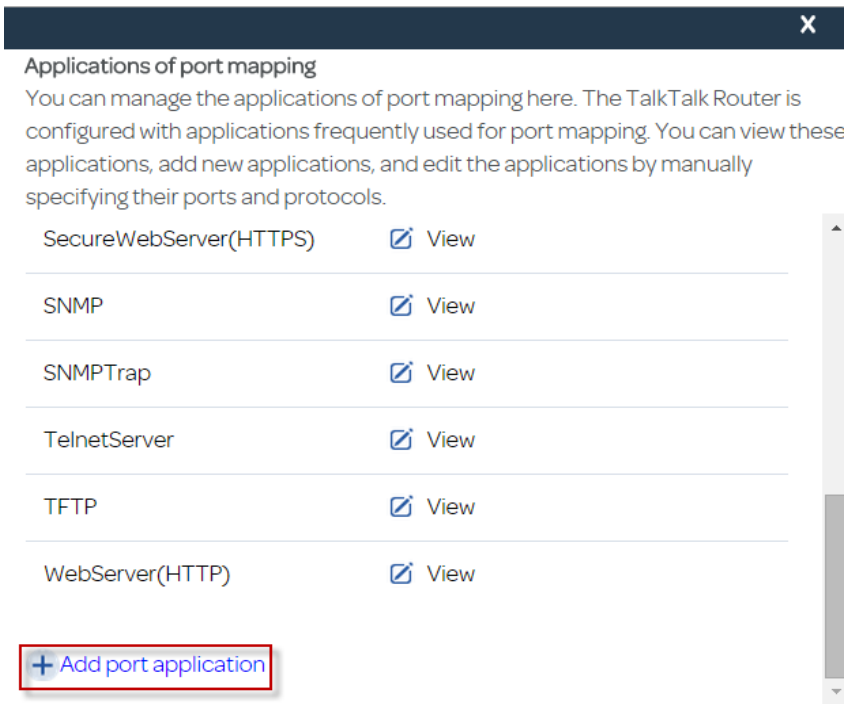
Before doing this you will need to know which ports need to be forwarded & ideally if they are TCP or UDP. You should be able to get this information from the vendor of the kit/software you are trying to use.

Once you have added this new application, it is then automatically added to the dropdown box's list of applications. This new one is then ready for selection in the same way as the previous example.

So first click the "Add port mapping application" link:-



This will display the same list of applications, go down to the very bottom of the list, where an "Add port application" link will be found, click on that:-



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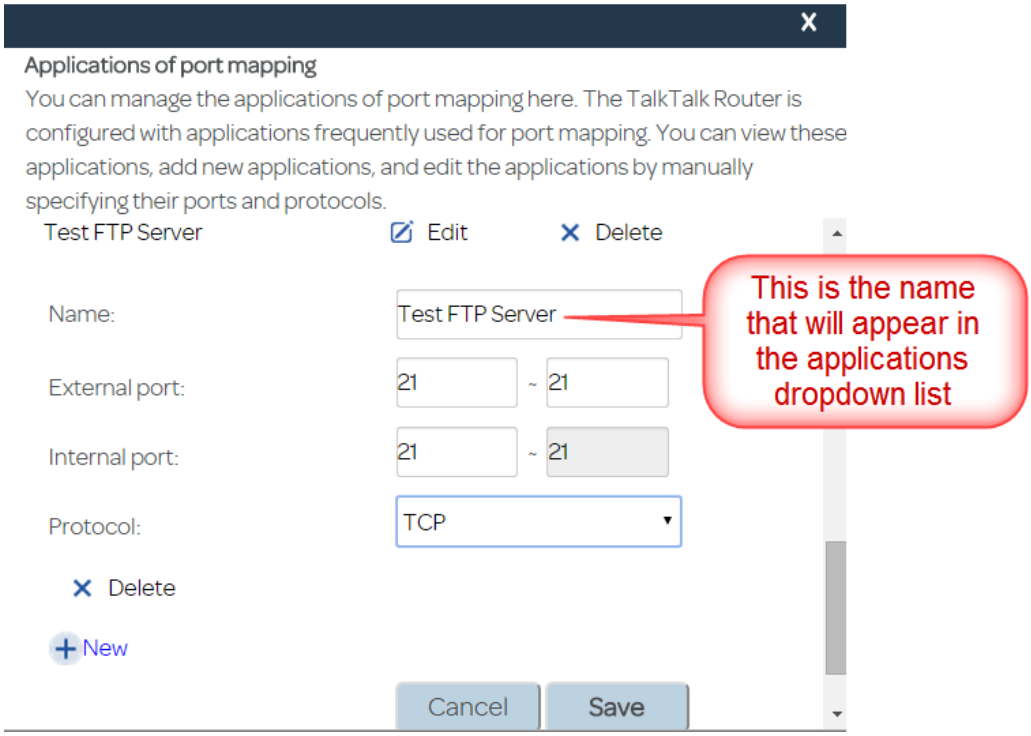
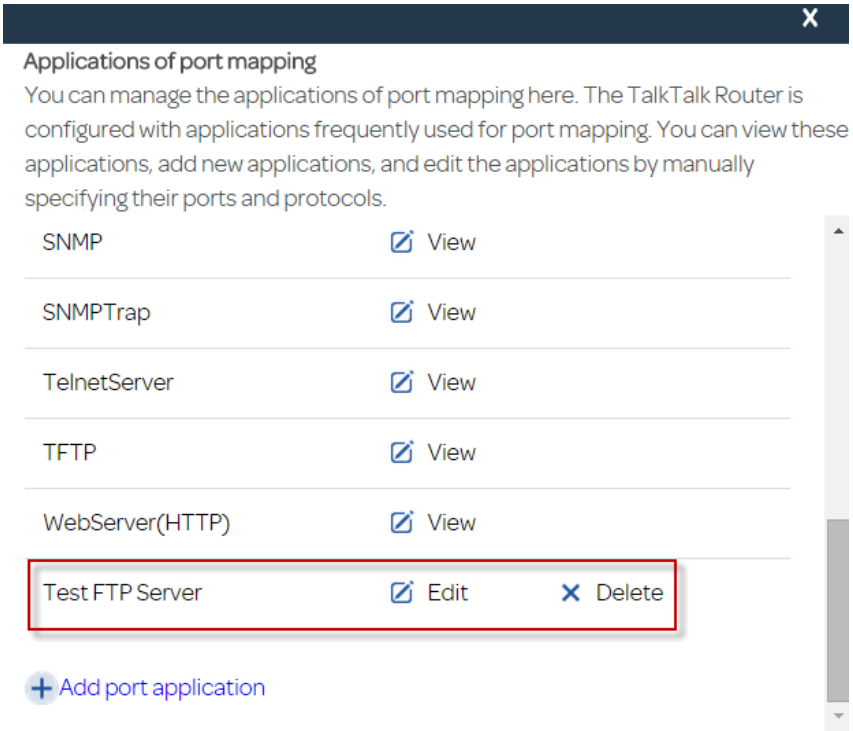
Although there is a pre-configured application for an FTP server, this example was used to test the port forwarding functionality of this router and is used as an example here. Give the new application a suitable name, add the ports & select the protocol. If in doubt, set the protocol to "TCP/UDP":-

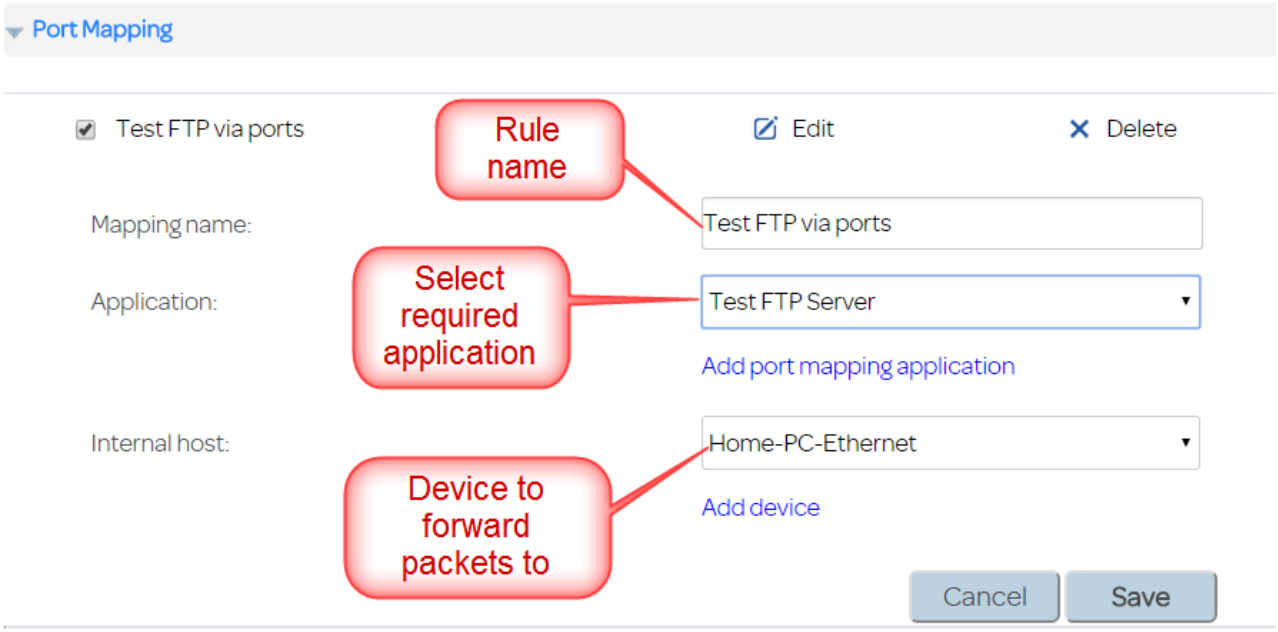


You will now see your newly created application has been automatically added to the dropdown list of available applications:-



Port Forwarding & Case Study

Now all you you have to do once back in the add new rule screen, is give the rule a name, select your new application and finally select the target device to forward traffic to. Then click the "Save" button & ***reboot the router***:-

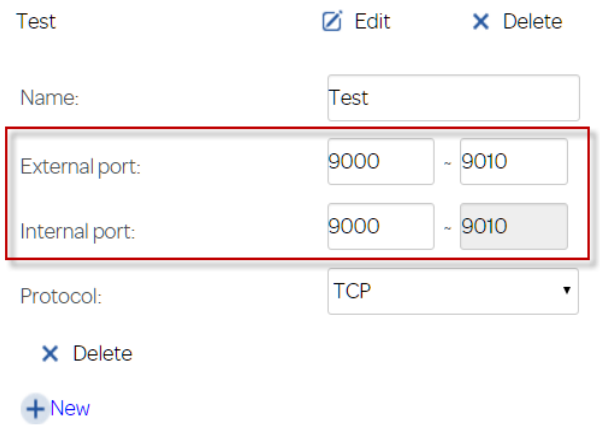


If the required device is not listed, click the "Add device" link above, you will need to know its MAC address.

Forwarding multiple ports

This example is based on the HG633/HG635 routers.

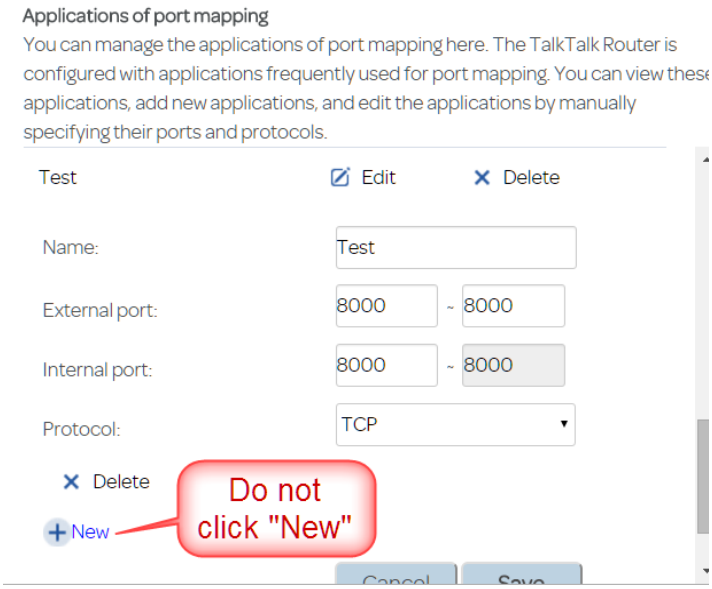
If for example you need to forward ports 9000 to 9010, as these are contiguous, so you can add them to the one application like this:-



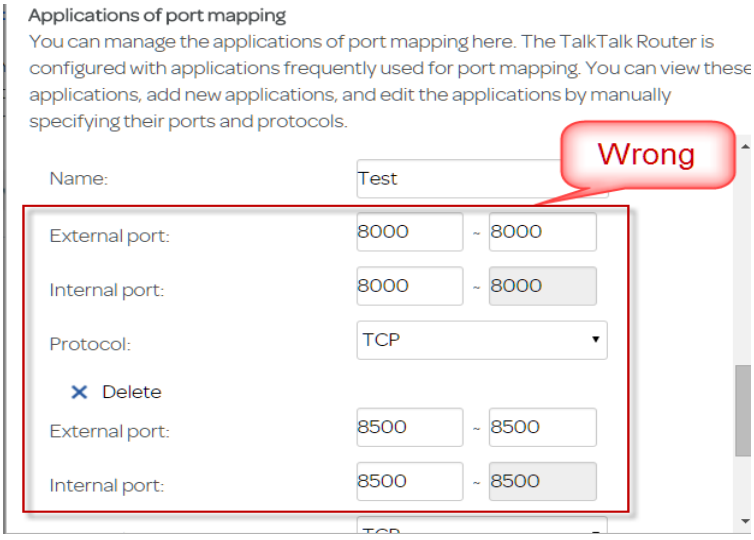
Continued on next page.

Port Forwarding & Case Study

However, if you want to forward the two ports 8000 & 8500, as they are not contiguous you cannot do this. So when creating the application, do ***not enter*** the port 8000 and then click "New" to add 8500, this will not work.



Otherwise you will end up with this, which will not work:-



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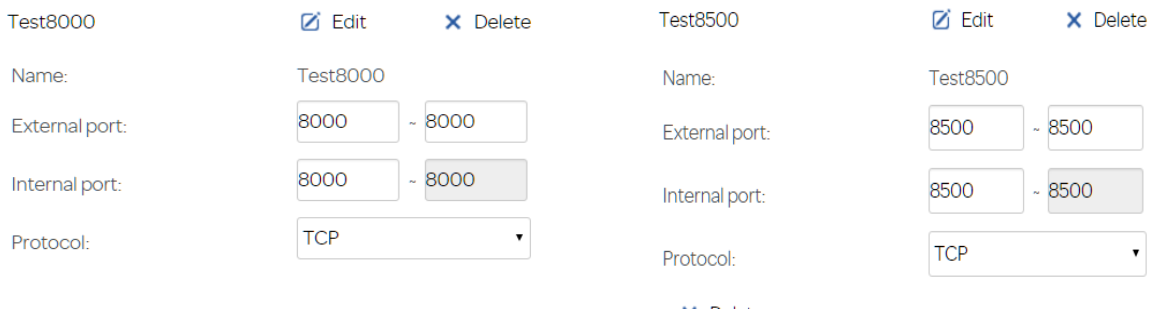
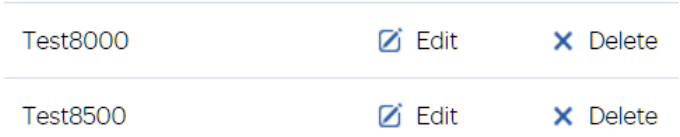
Port Forwarding & Case Study

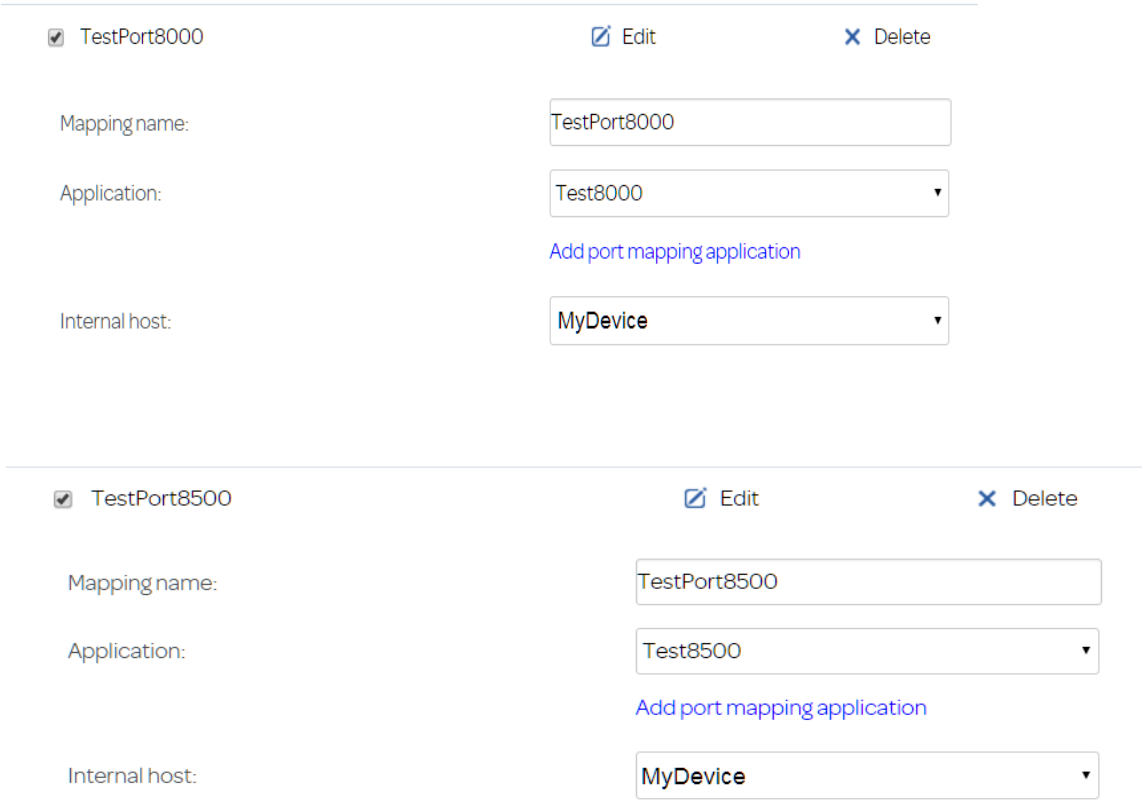
What you need to do is add one application per port, so you end up with two applications added (in my example “Test8000” & “Test8500”) like this:-



So they both now appear in the list of available applications thus:-



Now use them in your port mapping rules accordingly forwarding them both to the same internal host:-



Port Forwarding & Case Study

Universal Plug and Play

UPnP means that a device can open the ports it needs as it wants to, and it can close them afterwards, nice and safe and very automatic.

Port forwarding would only open those very same ports and keep them open even when the device was switched off, not as safe but will speed things up for that device as the router 'just knows' already (the entries in its routing table) what port/IP this traffic is destined for, whether the device is switched on and listening or not.

Some devices allow the use of UPnP, this can be be enabled within the router. To do this log into the router and follow the brief guide below:-

Huawei routers (except HG633 & HG635)

Advanced Mode > Advanced > UPnP

Huawei HG633 & HG635 routers

Home Network > LAN Interfaces > Universal Plug and Play

D-Link routers

Advanced mode > Advanced > Advanced LAN > UPnP

D-Link DSL-3780

Advanced mode > Advanced > Network Tools > Network Tools - UPNP & DNLA > UPNP Settings