# Port Forwarding & Case Study

## *Introduction*

This is to test the port forwarding of the Huawei HG523A router supplied by TalkTalk. The case study looks at the wider picture, not just setting up port forwarding, but also testing with applications, configuring of PC firewalls etc.

**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.

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://www.yougetsignal.com/tools/open-ports/ and only go to step 7, if it reports ALL of the ports as OPEN. You will have to run it once for each port you are trying to use.
7. Test using other people on the internet

Sections in this document

Case Study:-
- Test Setup
- FTP Server Settings
- FTP – active & passive modes
- Port forwarding on Huawei routers
- Windows 7 firewall settings
- Test Locally
- Test from Internet
- DDNS
- Port Forwarding to a web server
- Apple MACs running Windows applications
- Port Fowarding on other routers
- Universal Plug and Play (UPnP)

# Port Forwarding & Case Study

## *Case Study*

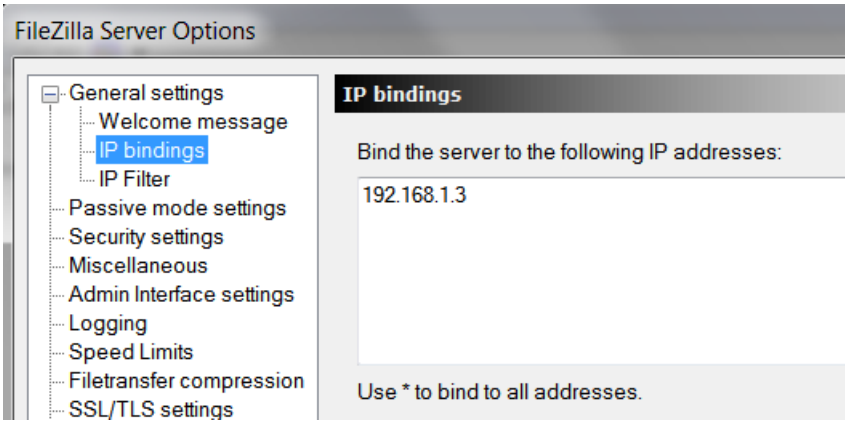
This case study looks not only at port forwarding, but applications on the local PC that require the port forwarding, plus adding rules to the firewall that runs locally on that PC. It also deals with how to test this (crucially from the internet, as well as locally on your router's network).

## *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

# Port Forwarding & Case Study

## *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.

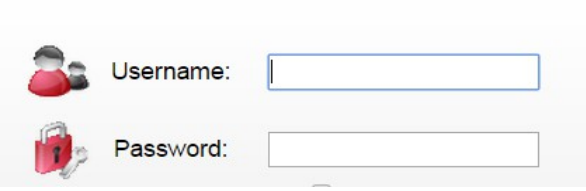
# Port Forwarding & Case Study

## *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:-

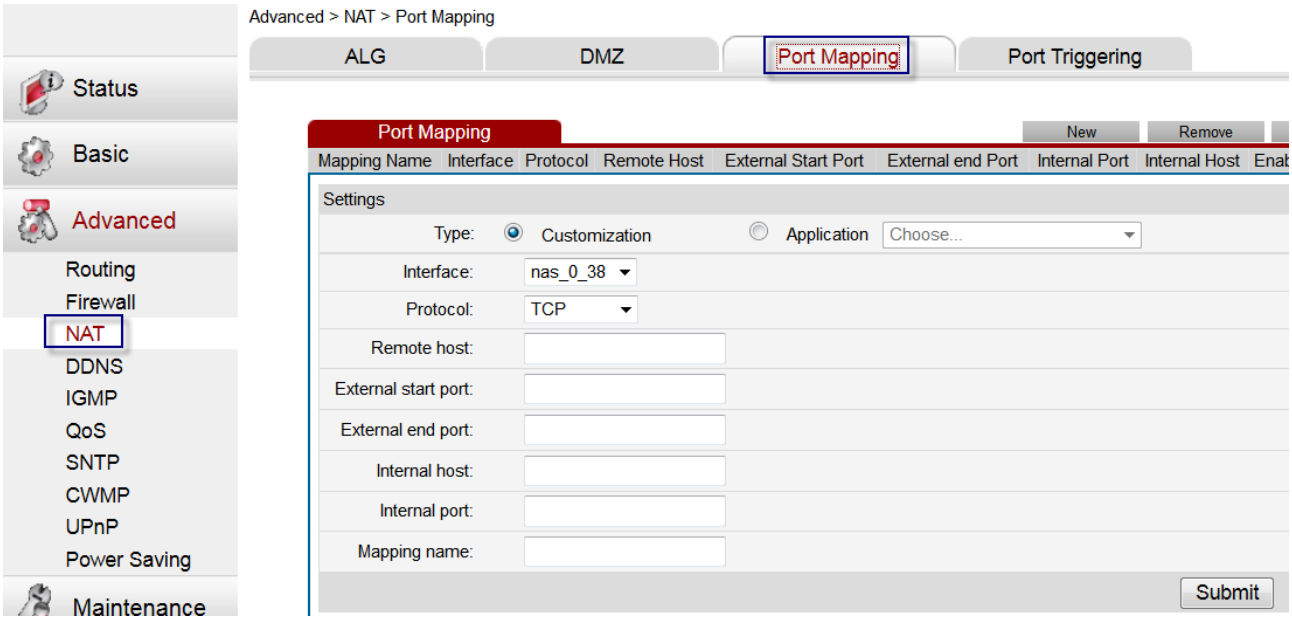
Username : admin
password : admin

# Port Forwarding & Case Study

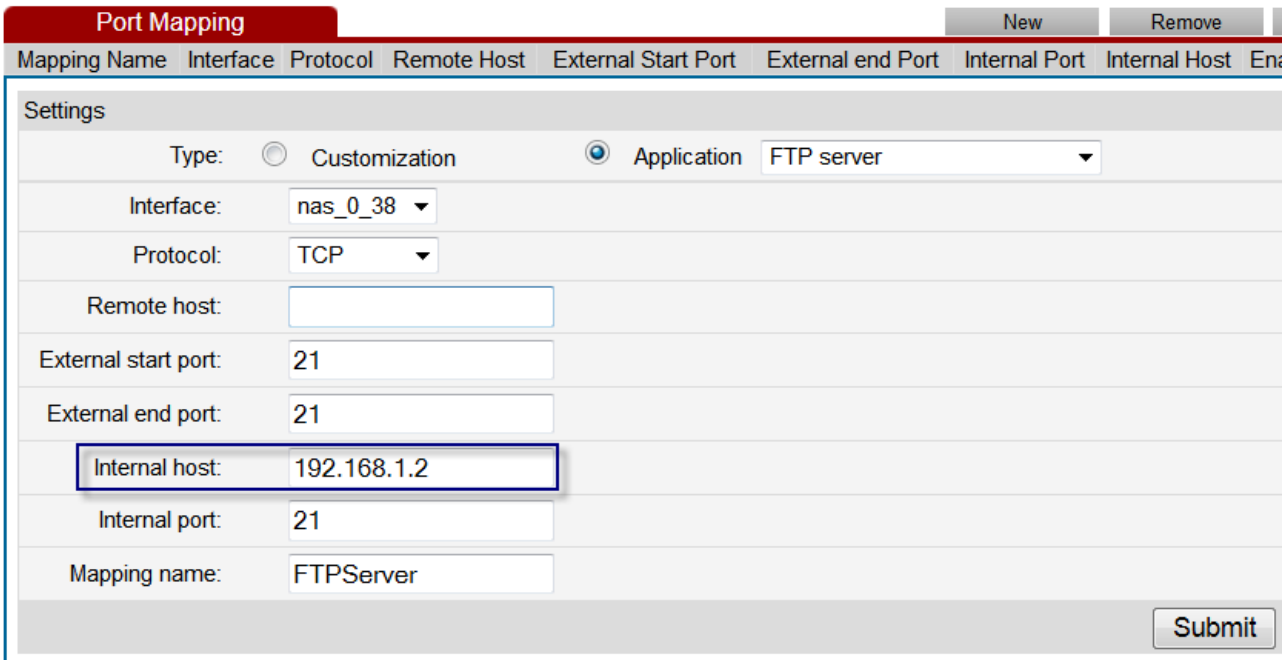
## *Port Forwarding on Huawei routers (& some DSL-3780s)*

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

Advanced > NAT > Port Mapping



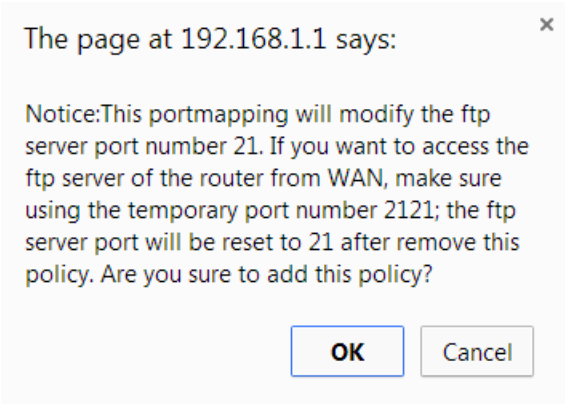

Either select an existing "Application", or use the "Customization" option. In this case the FTP Server application can be used, but the IP address (maybe 192.168.1.2) for the device hosting the FTP server will need to be added in the "Internal host" field:-




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

# Port Forwarding & Case Study

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




Click OK to that.

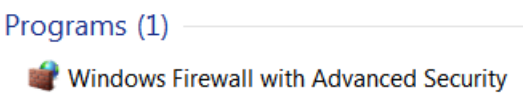
Click “Submit” & reboot the router.

For all other routers, please see this section.

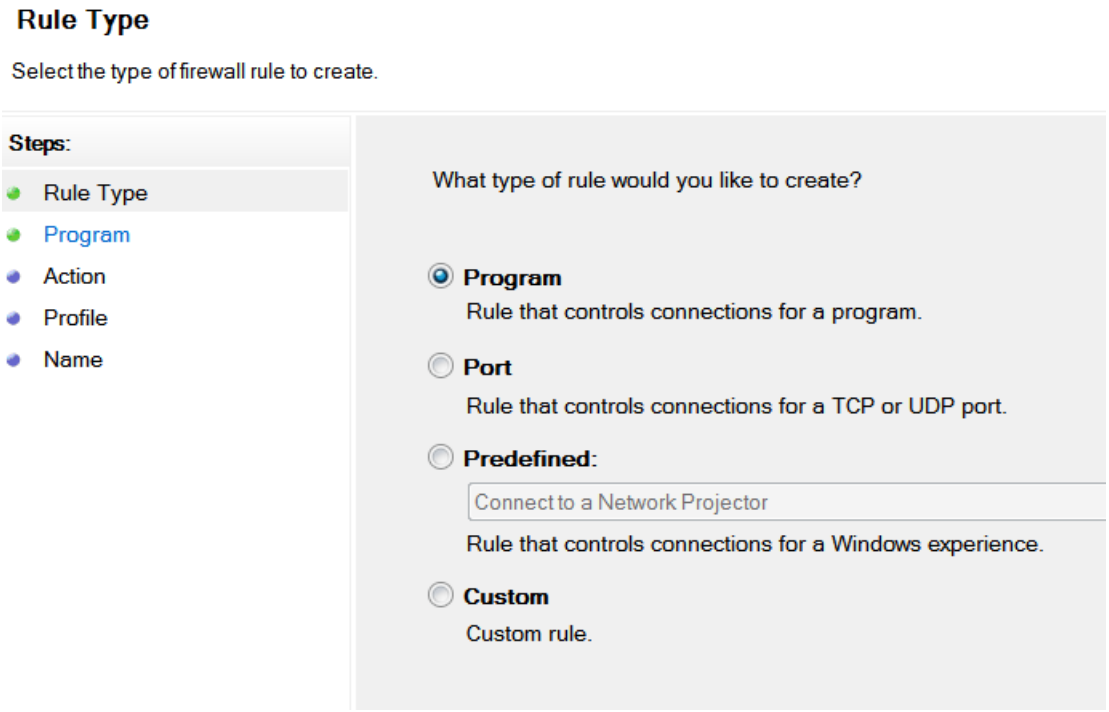
# Port Forwarding & Case Study

## *Windows 7 Firewall settings*

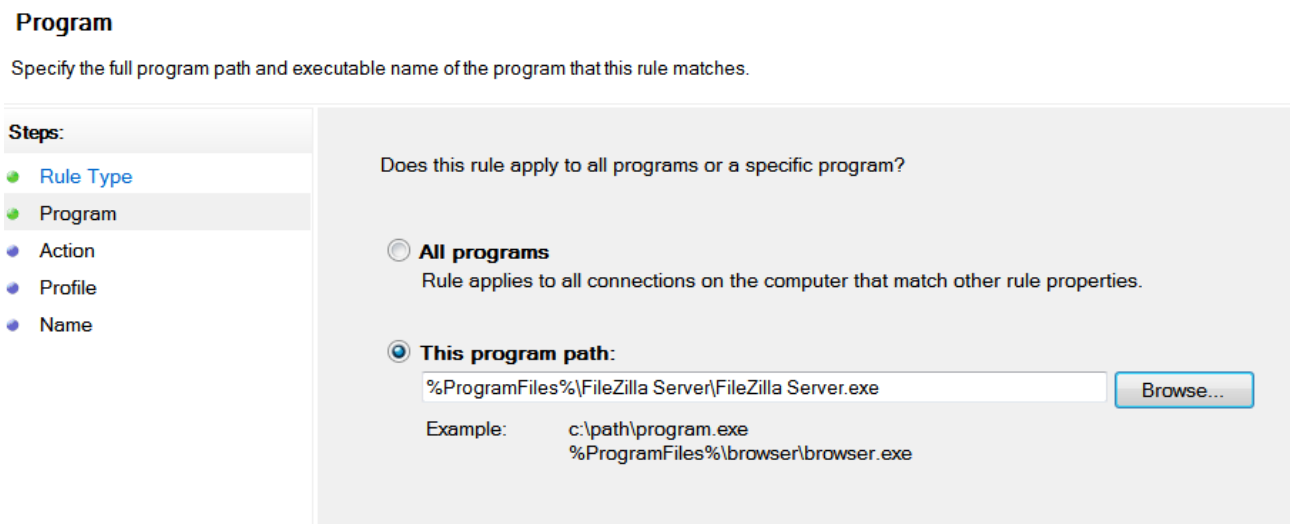
Go to:-




Create a new inbound rule:-

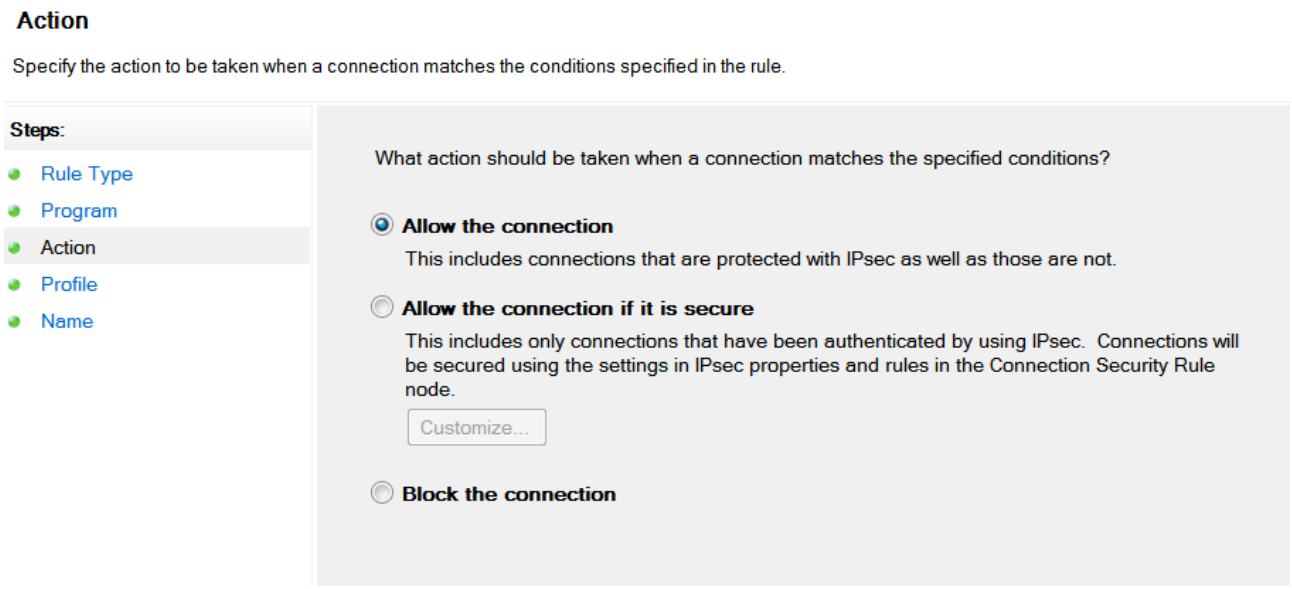



Click “Next” in the above screen, then on this next screen browse to the program's executable file. In the case of the FileZilla Server, allow the server application (not the interface to the server):-

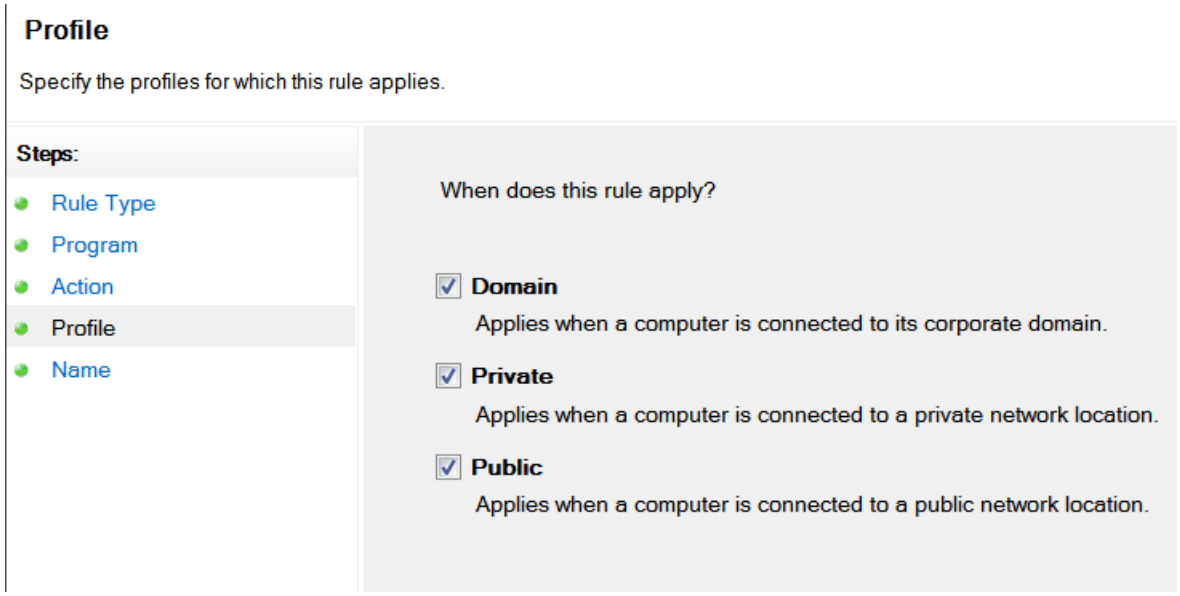


# Port Forwarding & Case Study

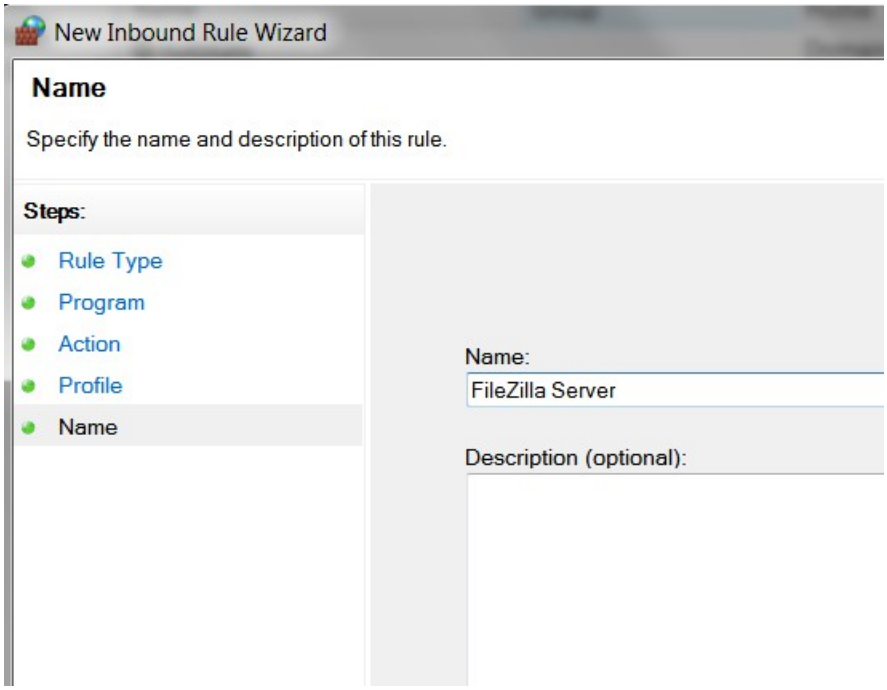
Click Next, then on this screen tick “Allow connection”:-




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.

# Port Forwarding & Case Study

## *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.

# Port Forwarding & Case Study

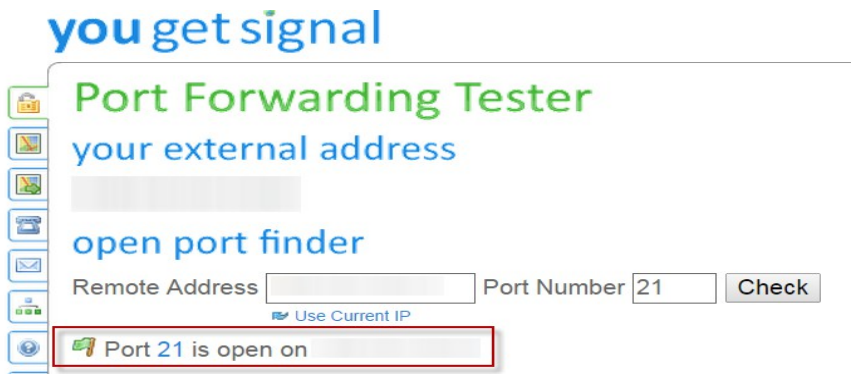
## *Testing from internet*

**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://www.yougetsignal.com/tools/open-ports/

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.

**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.

# Port Forwarding & Case Study

## *DDNS*

TalkTalk like most ISPs only offer static WAN IP addresses in their business packages & even then possible only as an extra option. DDNS however, gives you a static URL, which automatically updates itself with your new WAN IP address. This allows you to direct the client on the internet accessing your server software on local network via port forwarding, to target the DDNS URL, rather than your WAN IP address, which will change from time to time.

For more details on DDNS, see this TalkTalk help page:-

http://help2.talktalk.co.uk/using-ddns

# Port Forwarding & Case Study

## *Port Forwarding to a web server*

If you have a PC at say 192.168.1.100 which is hosting a webserver 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:-

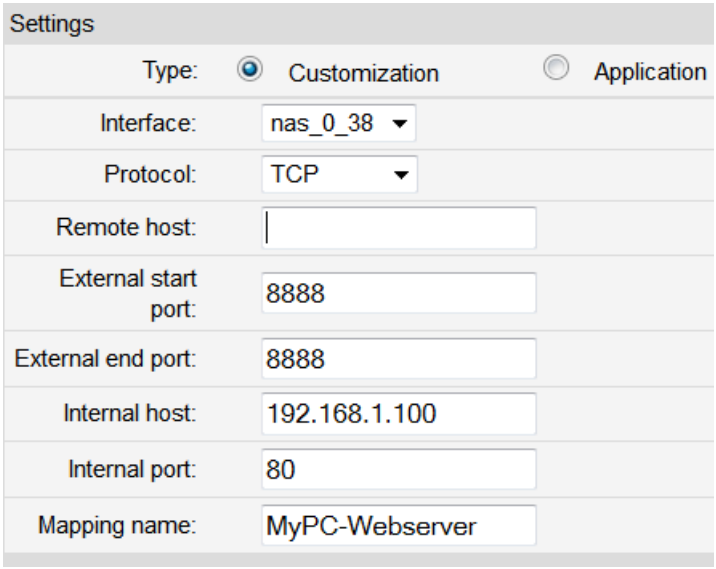
http://a.b.c.d

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), it displays a login banner & your connection never reaches the web server on your PC.

What you need to do is choose an unused TCP port number (maybe 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 connection to:-

a.b.c.d:8888

# Port Forwarding & Case Study

## *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*

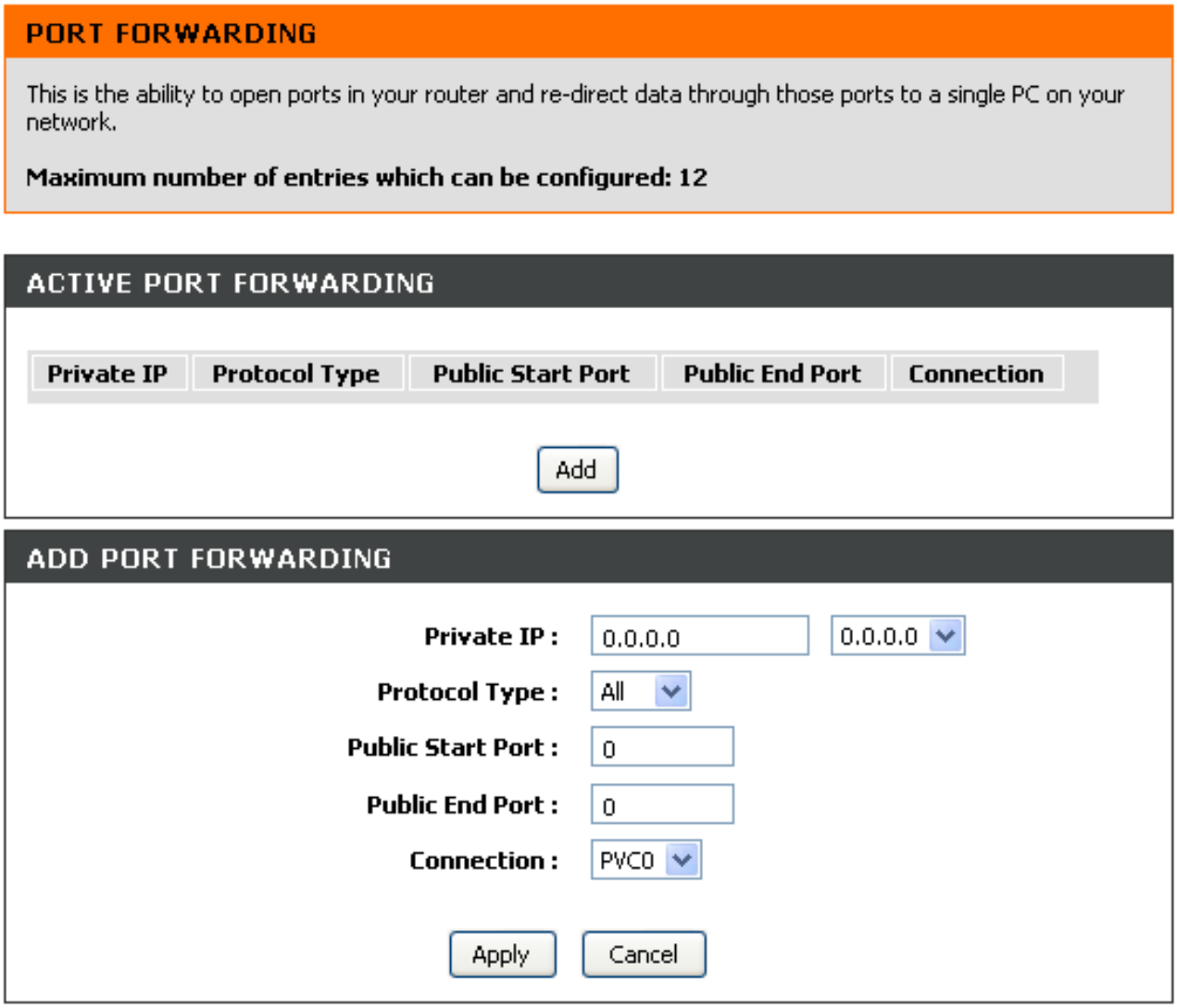
This will depend on the make & model of router that you have. The following are included in this guide. Once the PC firewall & port forwarding is all done, see the section on testing from the internet.

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 HG635 Super Router
5. HG635 & bridge/wireless extender

# 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.

# Port Forwarding & Case Study

## *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.

With this variant of the DSL-3780, you have to set up port forwarding in two places:-

1. The actual port forwarding rules (called “Virtual Servers”)
2. The firewall (this is only part of the firewall, the section required to be modified is called “Applications”)

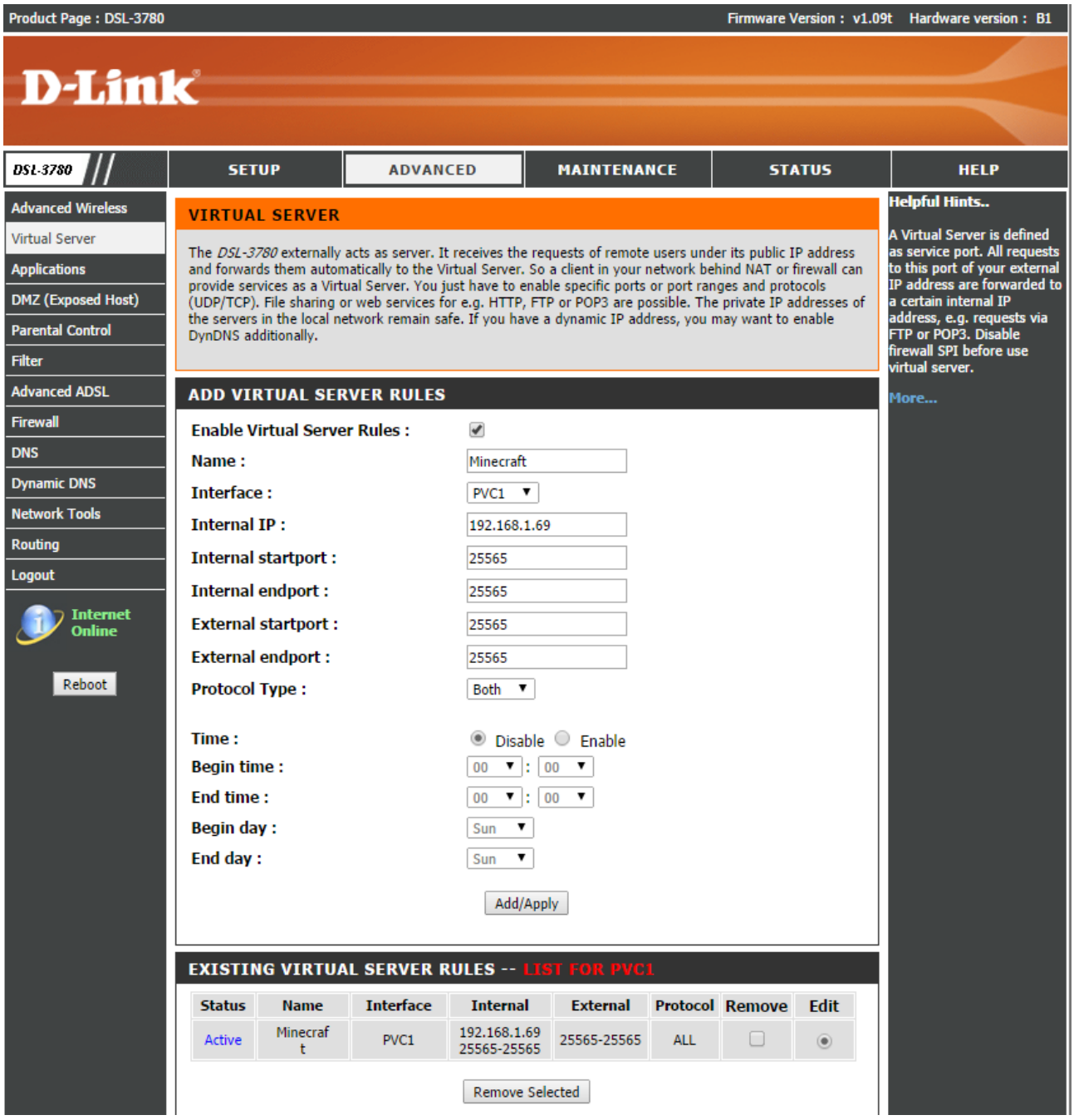
With either part you will first need to log in to the router.

# Port Forwarding & Case Study

## 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 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” (no Port Forwarding option on this router):-



# Port Forwarding & Case Study

To configure the port forwarding on this router:-

Tick to enable virtual server rules

**Name:** Enter what ever name you wish

**Interface:** PVC1

**Internal IP:** 192.168.1.2 (this is the IP address of the device you are forwarding to)

**Internal startport:** 80 (start port of a range, or just the one port you want to forward)

**Internal endport:** 80 (end port of a range, or just the one port you want to forward)

**External startport:** 80 (start port of a range, or just the one port you want to forward)

**External endport:** 80 (end port of a range, or just the one port you want to forward)

**Protocol type:** All

**Time:** Disable

Click “Add/Apply".

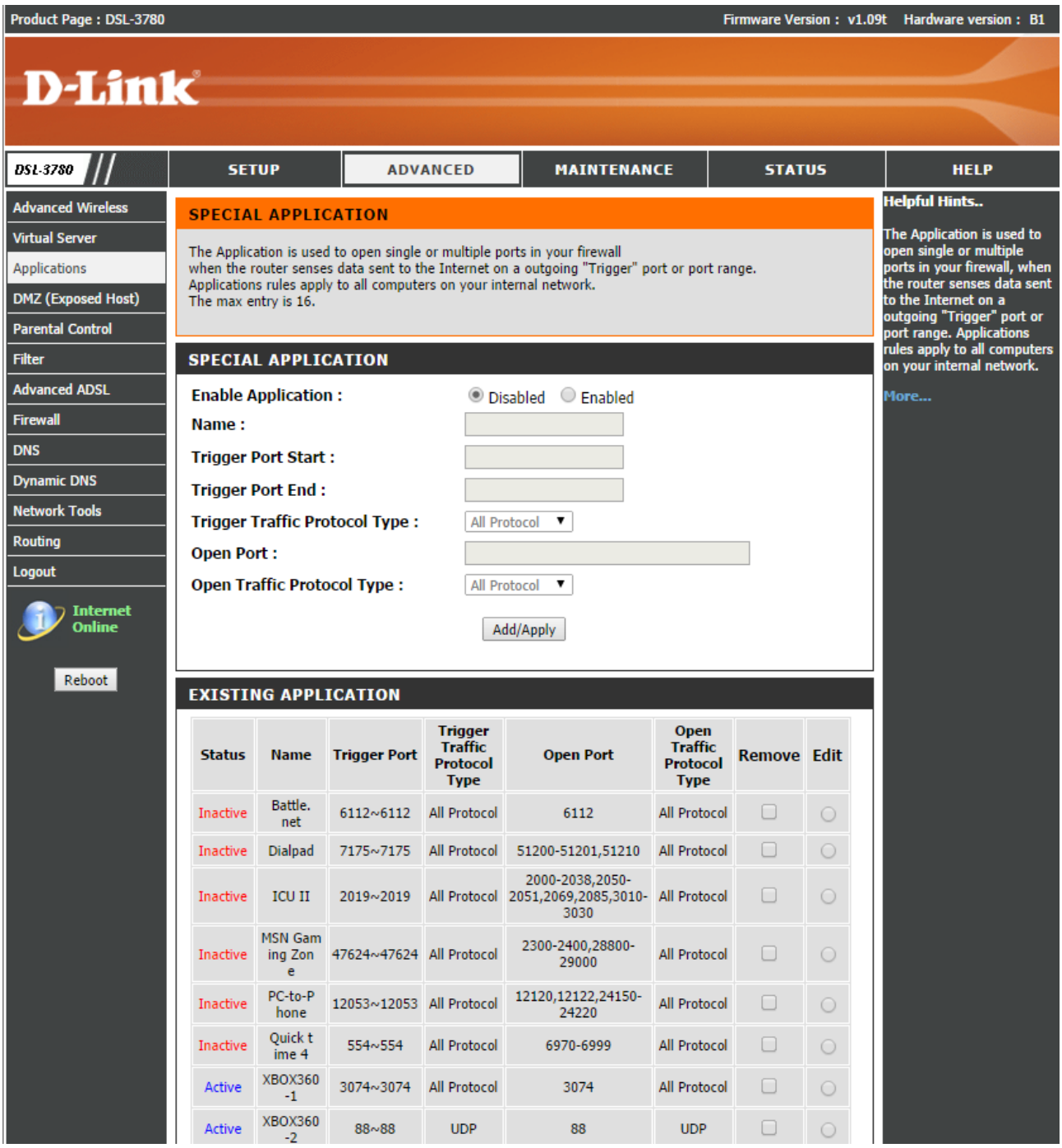
Now go to “Applications” shown on the next page.

# Port Forwarding & Case Study

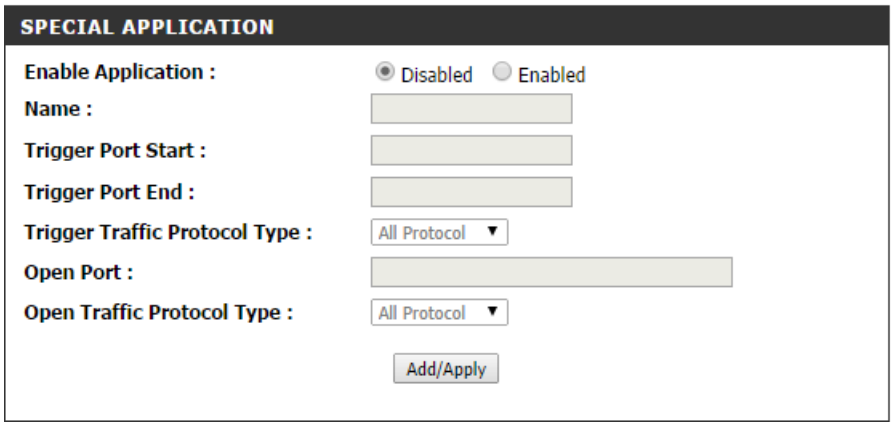
## Applications

With the DSL-3780 you may also have to open up the ports on it's own firewall in addition to the firewall on the device you are attempting to forward these ports to.

This is labelled as applications (right underneath virtual server).



# Port Forwarding & Case Study




Typical settings:-

**Enable Application :** Enabled
**Name :** MyApplication
**Trigger Port Start :** 80
**Trigger Port End :** 80
**Trigger Traffic Protocol Type :** All Protocol
**Open Port :** 80
**Open Traffic Protocol Type :** All Protocol

Click “Add/Apply”.

Then ***reboot the router***.

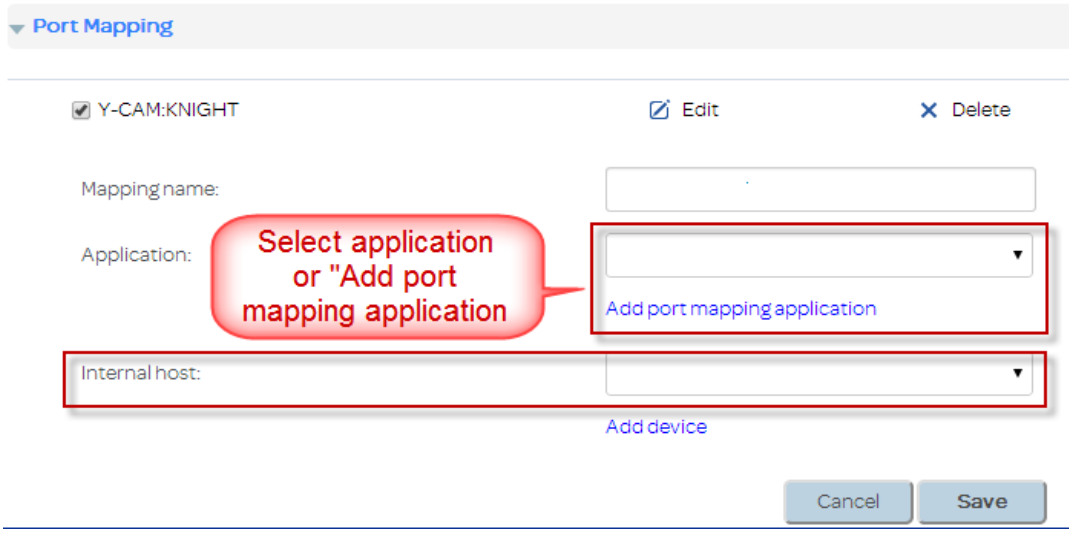
# Port Forwarding & Case Study

## *HG635 Super Router*

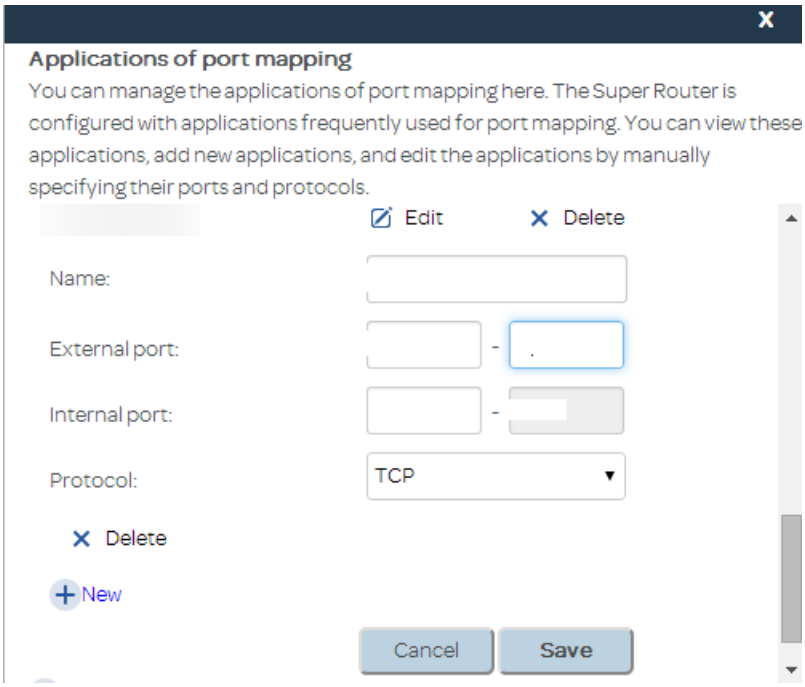
This is different to other routers, because instead of pointing it to an IP address, you point it to a "known device" which is identified by it's unique MAC address. First log in to the router.

Select "Internet" from the tabs across the top and then select "Port Forwarding". Expand "Port Mapping" and select "New Port Mapping".

Enter a name for this rule in the "Mapping Name" field. Choose your application from the dropdown box:-



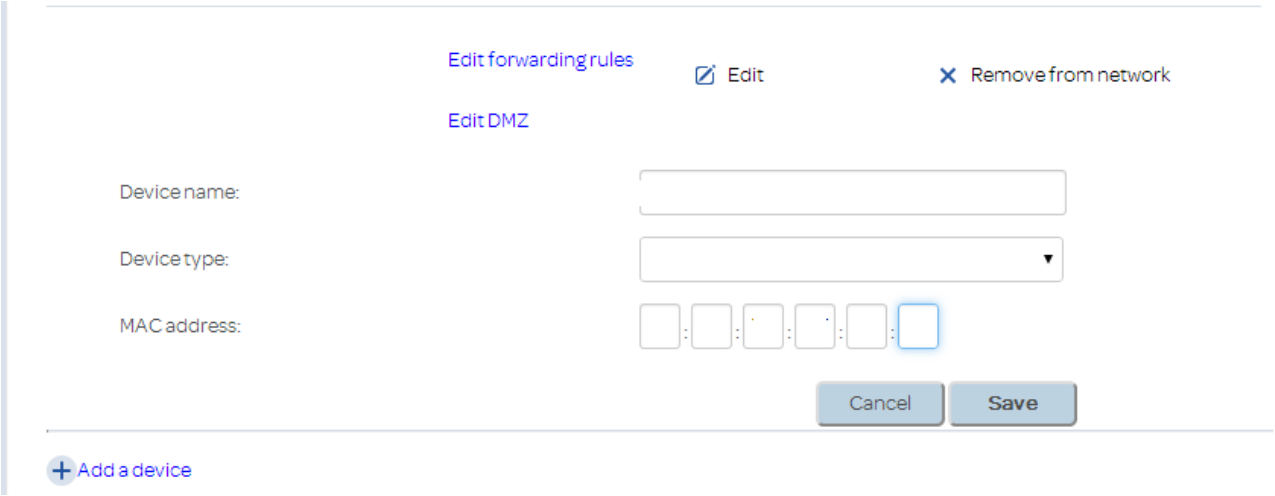

If your application is not listed, click the "Add port mapping application" link. Set the application name up add a range of ports to the external port list, if allowing only one port, add it to both the start & end range boxes. Repeat this for the internal port numbers (using the same ports). Set the protocol to be TCP, UDP or TCP/UDP, depending on which transport protocol is used by that port:-



# Port Forwarding & Case Study

In the first Port Mapping screen select the internal device to route the traffic from the selected ports to. You can then specify a device an internal host. You can choose from any previously connected devices in the list, or Add a new device.

Unlike most routers, you do not use the IP address, but that device's MAC address (Media Access Control – nothing to do with Apple MACs). When entering the MAC address here, do not enter any separators, typically the colon (:) or hyphen (-)




The options for the “Device Type” dropdown box are:-

Laptop computer
Desktop computer
Smartphone
Tablet
IP set top box
IP camera
IP phone
Game machine
Unrecognised device

Click “Save” & reboot the router.

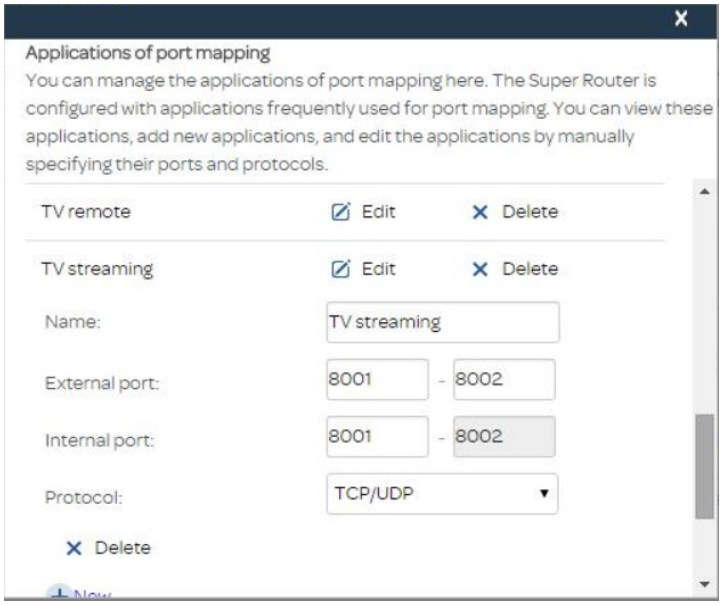
# Port Forwarding & Case Study

**HG635 & another Wireless Access point or bridge**

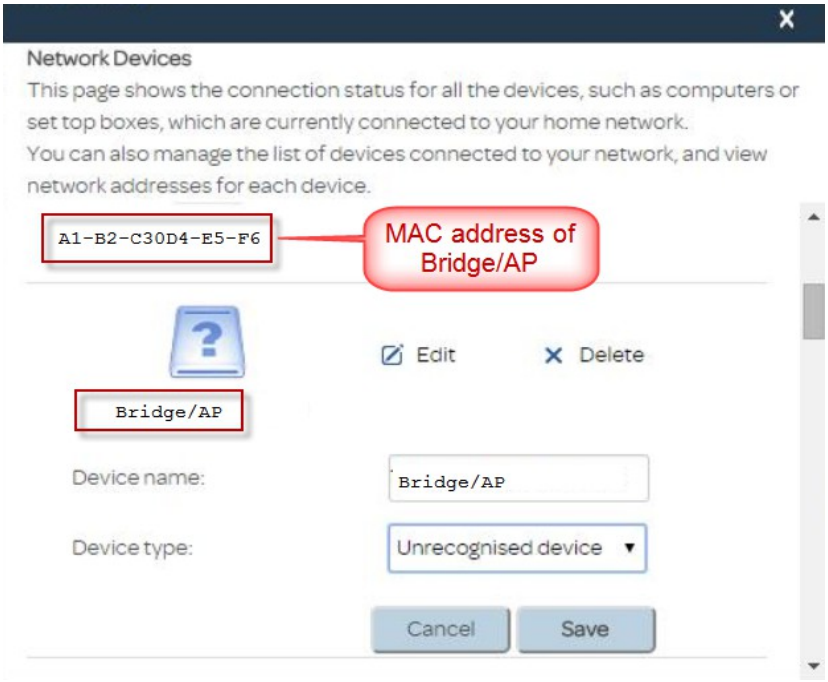
There can be problems getting this to work with devices connected to the other side of the bridge, or Wireless Extender Access Point. The HG635 cannot reach those MAC addresses by port forwarding, as if the bridge is blocking it. The bridge will appear as a known device in the Super Router and what you have to do is to point the port forwarding rule at the bridge. It will then work fine. Tested with a TP-Link TL-WA890EA bridge/wi-fi network extender.

The following screenshots show such a rule, note that the MAC address of the device in question is unknown to the rule, only the MAC address to the bridge/AP is known.

So to setup such a rule from the initial port mapping screen configure as appropriate (select or add the application) :-

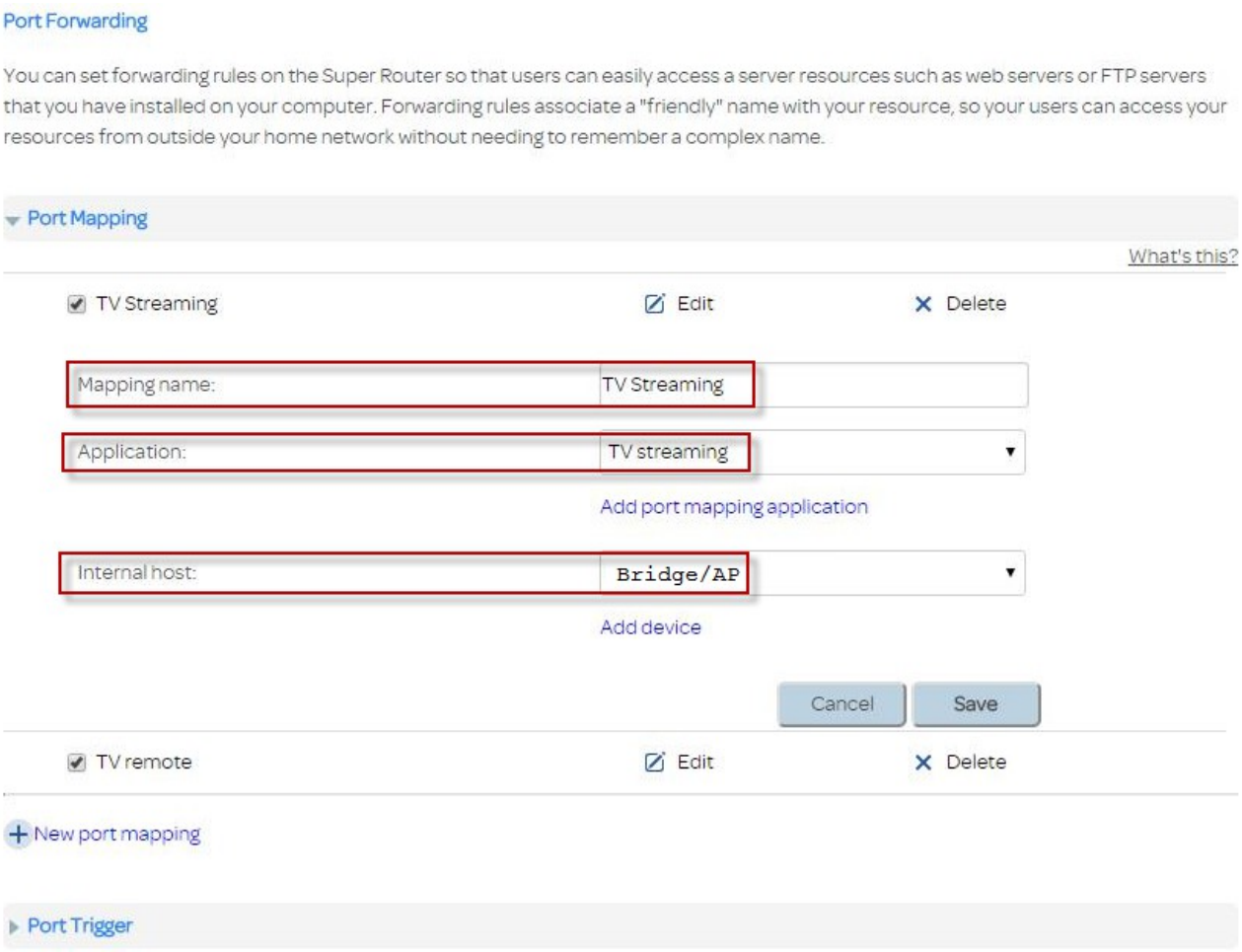



Then if the device (in this case the bridge or AP rather than the actual device on the other side of the bridge) is in the “Internal Host” dropdown box, add it with “Add device”:-



# Port Forwarding & Case Study

The end result would be:-



# 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

Advanced Mode > Advanced > UPnP

D-Link routers

Advanced mode > Advanced > Advanced LAN > UPnP

D-Link DSL-3780

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

Huawei HG635

Home Network > LAN Interface > Universal Plug and Play