Casual remote operating

By G4AON

Remote operating without the hassle of router configurations, and without the expense of a fixed IP address.

You really can operate a server through a Carrier Grade Network Address Translation (CGNAT) setup at your ISP. You can even operate an Ethernet connected Icom radio from an iPhone from anywhere with an internet connection.

The easy networking solution is to use Tailscale or ZeroTier, both currently free for personal use. These companies provide a means of creating a secure virtual private network in just a few minutes, without needing network skills, and without needing to touch your router. These solutions also allow you to connect to your home PC when using a mobile (cellular) connection, at both your home and your remote location.

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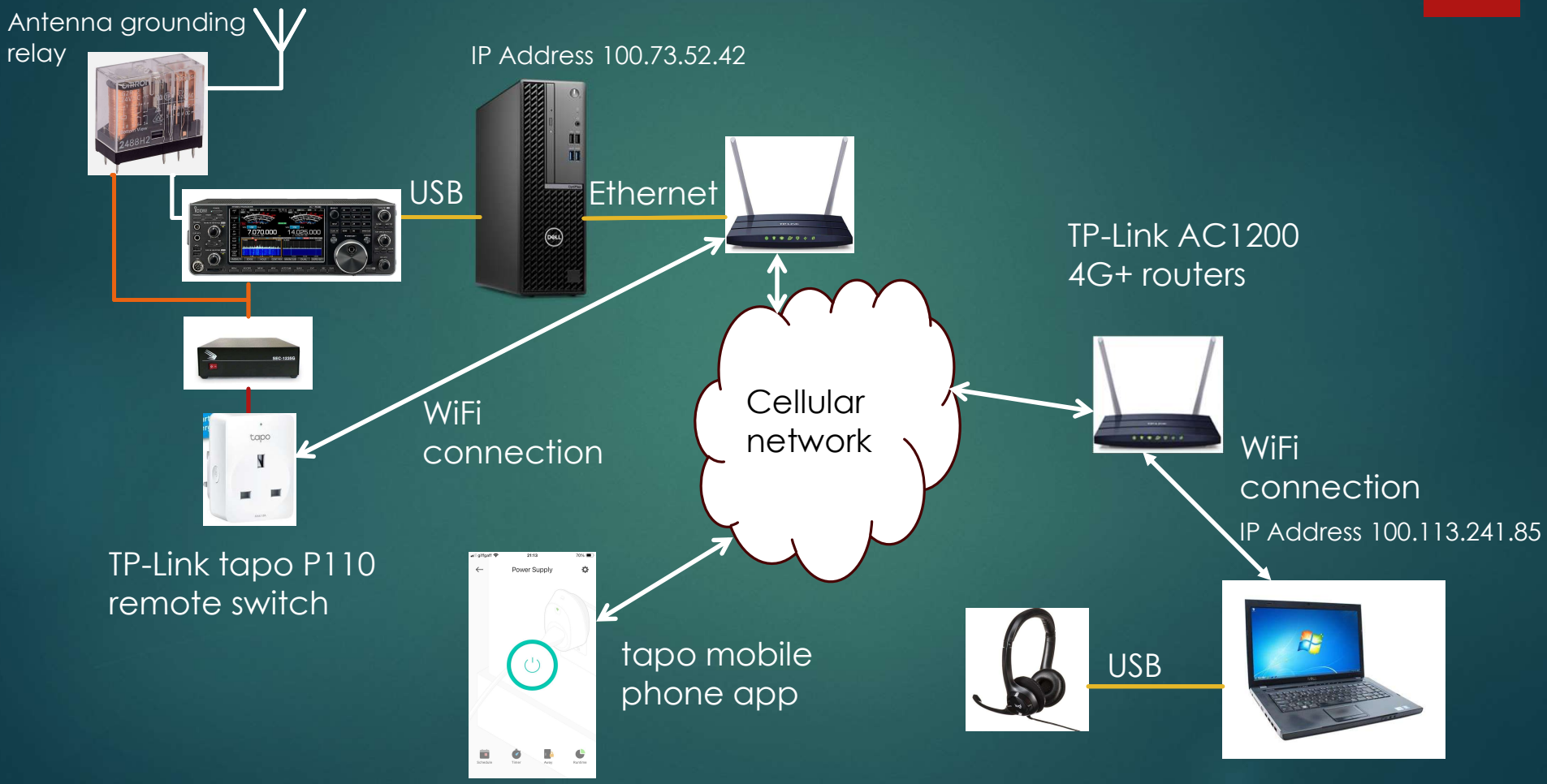
v5

Overall system setup



Hardware setup

The TP-Link AC1200 router is fitted with a SIM card to use it with a cellular network. You can use any router, I just happen to prefer to use cellular networks as in the UK it is currently much cheaper than a landline or fibre connection, and there is less likelihood of RF disrupting the connection.

Mains power to the radio power supply is remotely turned on with a WiFi connected switch. There are no “hubs”, or anything else needed with a tapo P110 remote switch.

Note; Icom radios will respond to a USB command to turn on, there is no need to leave anything powered except the PC and router.

The antenna for HF is a 20m long end fed with a 49:1 transformer and feedline choke.
A 12V relay grounds the antenna and open circuits the radio antenna connection when power is turned off.

Software setup

Both the desktop PC and laptop run Tailscale software to create an encrypted virtual network. Note the IP address of the PC connected to the radio, this is allocated by Tailscale and will remain the same address for any subsequent connections.

On the desktop you run the Win4Icomsuite server program, change the ports from 50001/2/3 if necessary to avoid a clash with AnyDesk, if you use that program.

On the laptop, run the Win4Icom sound client and the Win4Icomsuite programs.

In order to be able to remotely make changes on the desktop PC, use either VNC software (poor), AnyDesk (better), or TeamViewer (best). Some users report that the free version of TeamViewer ceases working after a few sessions and requires the software to be purchased, your mileage may vary, so far I have not encountered that issue. AnyDesk and VNC are free.

The TP-Link tapo remote mains switch is controlled from a mobile phone app. The Icom radios can be remotely switched on and off, turning off the power supply is not an issue.

Software setup of the desktop PC (server)

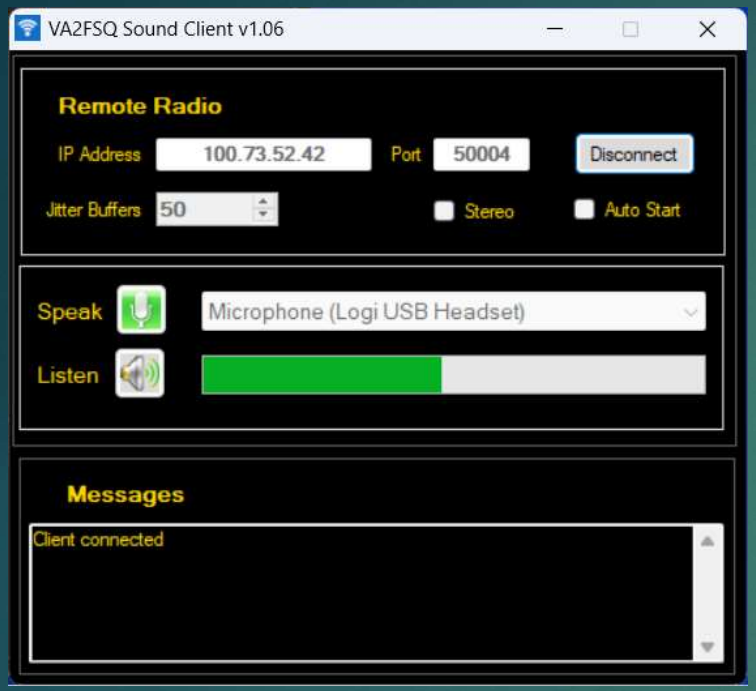
This is the Win4Icomsuite server program running on the desktop PC connected to the radio.

On a network with less latency than this cellular connection, you can use a lower jitter setting.

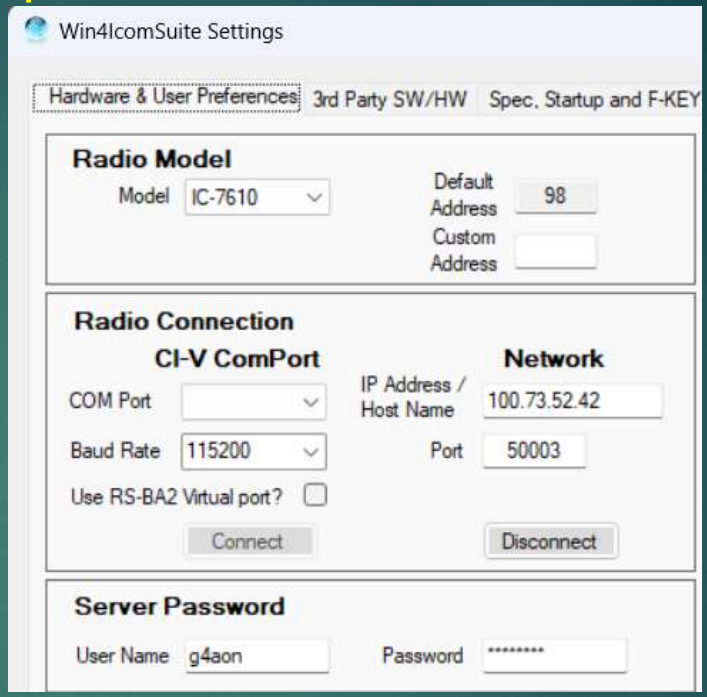
The IP address is the one of your desktop PC on the Tailscale network. It is not a local 192.168.1.xxx one.

The “Speak” and “Listen” settings depend on your radio USB connection.

Software setup of the laptop



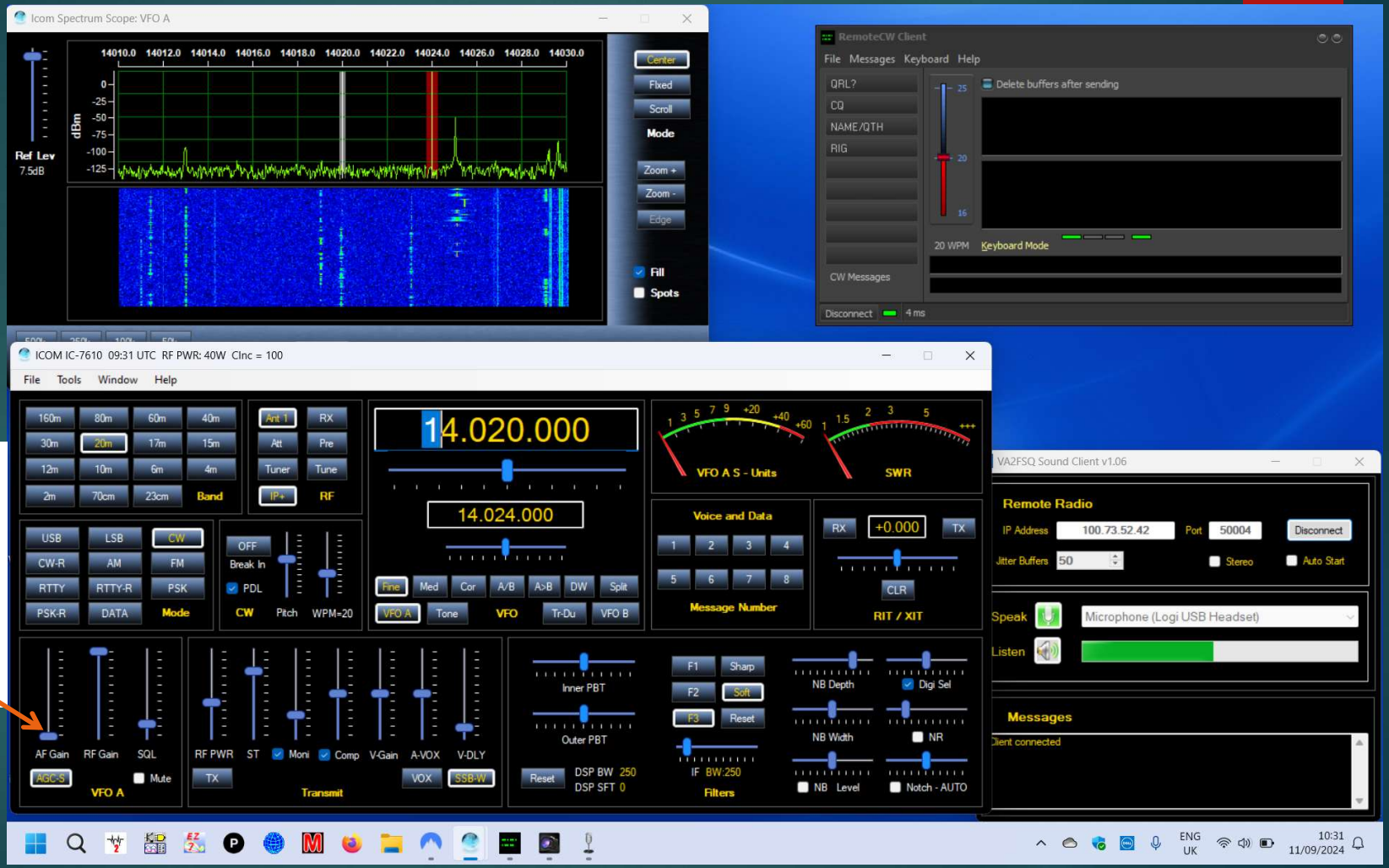
These are the sound settings on the remote PC (laptop). The "Speak" and "Listen" settings are for a USB headset.



These are the control settings for the remote PC (laptop). You connect the Network, leave the CI-V settings alone as these are for a locally connected radio.

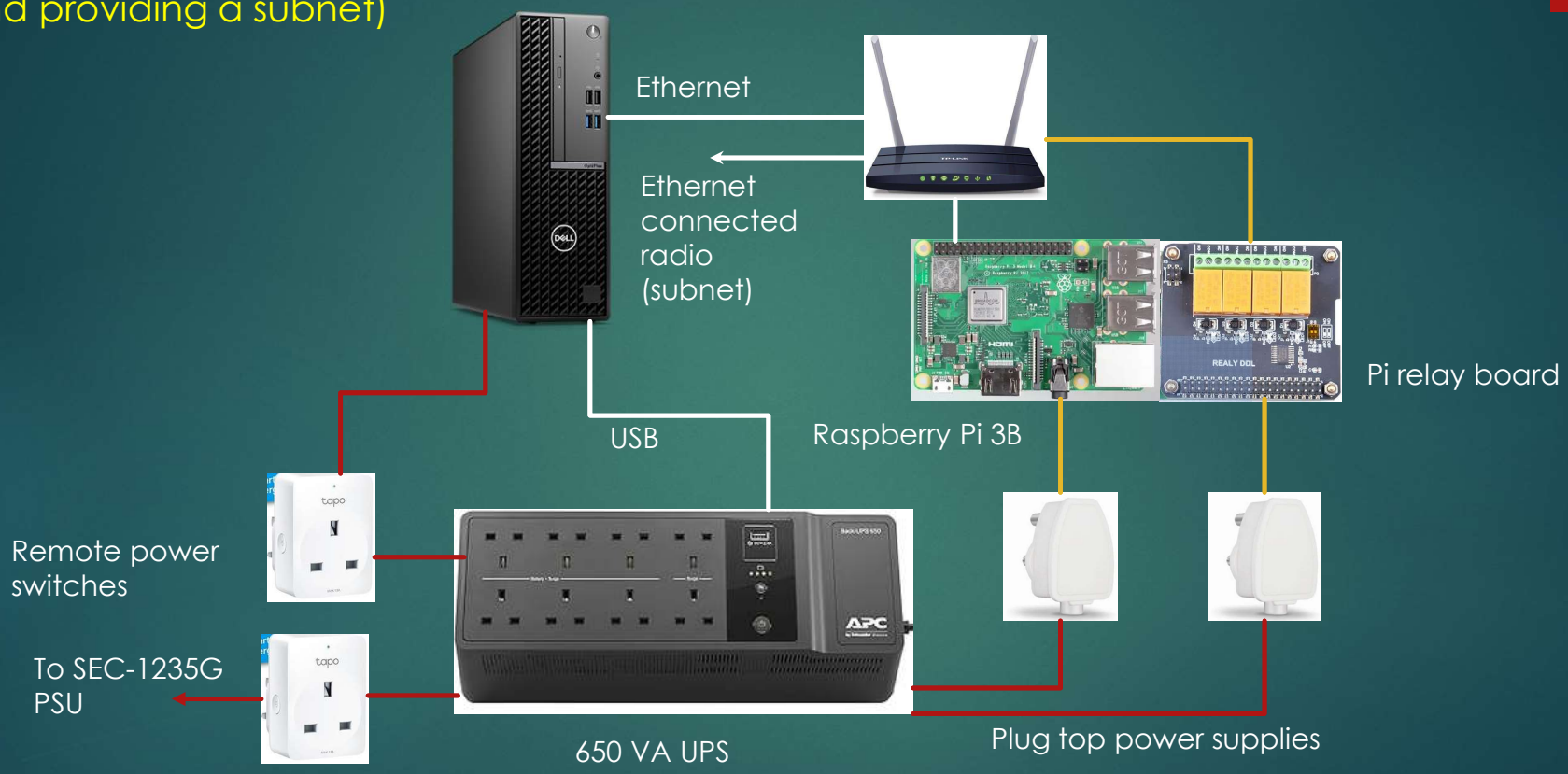
Win4IcomSuite running on the laptop

Note the AF Gain is set low, this is the local radio audio (speaker) output



Making the system robust

(and providing a subnet)



Robust configuration

Both the desktop PC and the Raspberry Pi run Tailscale software, in the case of the Raspberry Pi, it is configured to produce a subnet on the Tailscale network. The Raspberry Pi plugs into the router and any additional connected hardware, such as an Ethernet connected radio, becomes available across the Tailscale network. Note: to run a subnet you must use a different IP address range on your home network, do not use 192.168.1.xxx, otherwise any other network you use with the same range will not work… suggest using 192.168.73.xxx, or similar. Additionally, the Raspberry Pi is running a Python script to "ping" the internet every 2 minutes. If there is no response, the relay board disconnects the supply to the router for 10 seconds and the script tries another "ping" after a sufficient delay to allow the router to try and establish a connection.

The PC is configured to power up into a Windows "log-on" state, which allows for remote log-on. There is a USB connection between the UPS and the PC, software running on the PC monitors the UPS and can shut down the PC in a controlled manner as well as sending an email warning that the mains supply to the UPS has failed.

The UPS is configured to turn off the protected outputs if there is a mains failure lasting more than 5 minutes. The PC, Raspberry Pi, router and radio PSU are all powered from the UPS.

Clever tricks

The standard setup is where you run the radio control software on the laptop, and route audio across the network. This is OK for SSB, and to some extent it is also fine for CW and perhaps simple data operating, such as RTTY.

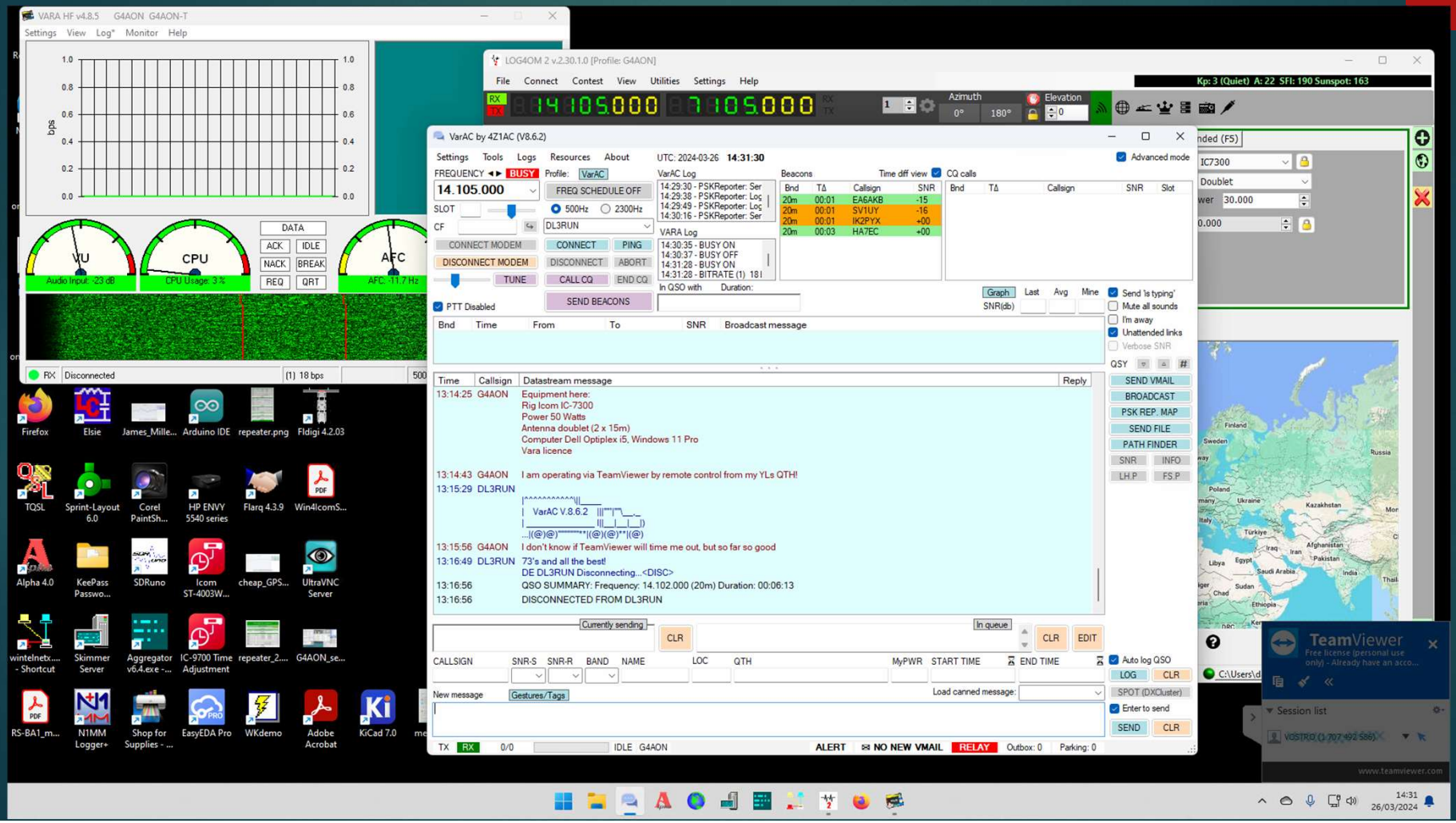
Unfortunately ARQ data modes, such as Vara and Pactor, are fouled up by the delays through the system when running the data software on the laptop. Also, CW tends to sound erratic when sent over a cellular network with Win4Icomsuite using it's own terminal.

The solution for data modes is to run the data software on the PC with a direct connection to the radio, then operate the data software by remote access using TeamViewer or AnyDesk.

You can either setup the radio using Win4Icomsuite on the PC, or on the laptop, the latter saves changing settings from normal voice modes. You can shut down the Win4Icomsuite leaving the radio running. Programs such as VarAC directly control the radio and send logging data to the log program running on the same PC.

For CW, run the Win4Icomsuite on the client laptop using the RemoteCW software by DF3CB, together with a Winkey on the server PC.

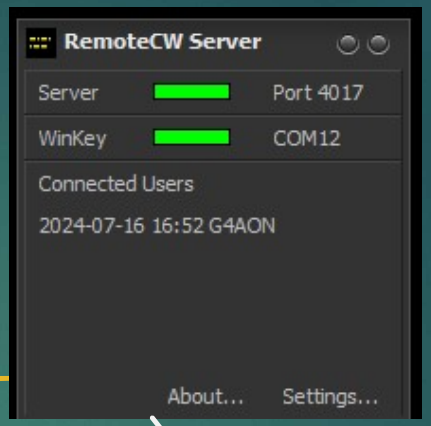
Screen image of a remote VarAC session

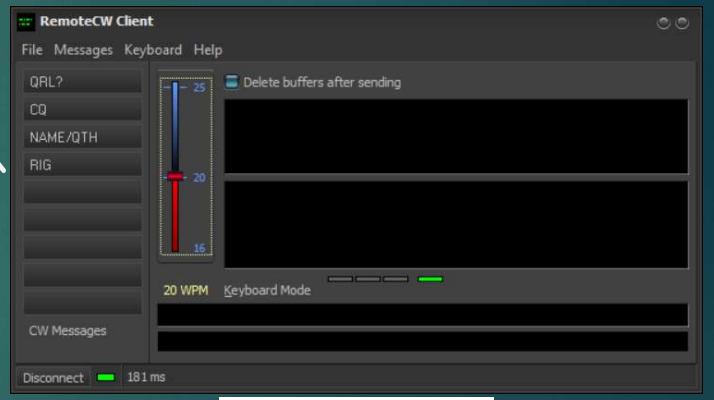


CW setup

IP Address 100.73.52.42

USB



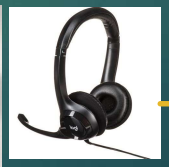


Winkey keying output

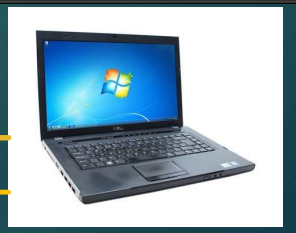
USB

Winkey

Winkey



USB



CW setup continued

The problem with sending CW "directly" via Win4Icomsuite is that when using a poor connection, such as a cellular one, the sent CW will be erratic and not only will you get a reputation as a poor operator, the resultant side tone is very distracting.

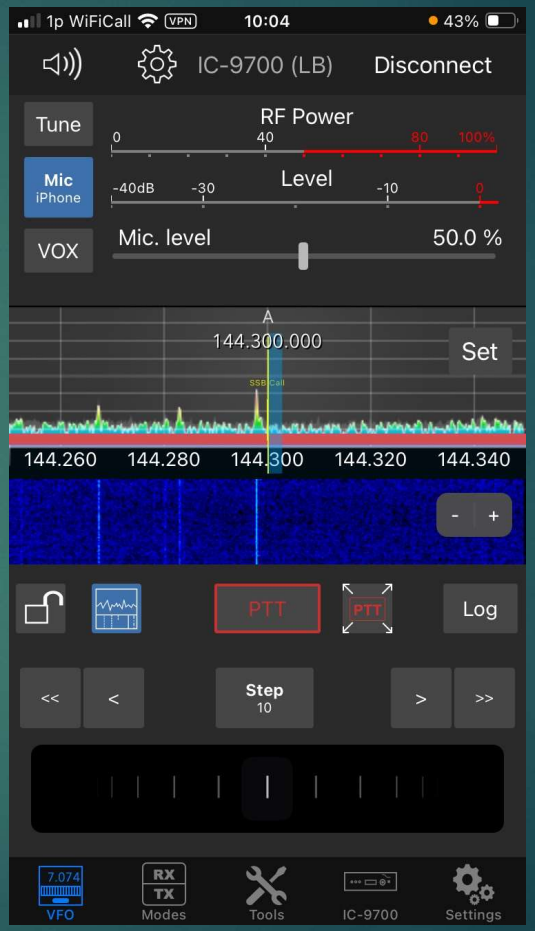
The solution is to connect a Winkey to the server and to run RemoteCW, obviously the server version runs on the server PC and the client version on the client laptop. This works alongside but independent of Win4Icomsuite. RemoteCW is not really supported but works reasonably well, although at the time of writing this, unfortunately the current version (1.2) doesn't send AR (or SK) correctly with paddles, although from a keyboard "+" sends AR without a space between A and R…

I have been using an old RS232 Winkey at the radio end and it works fine. I have a second (USB) Winkey with paddles on the client laptop, I use either the laptop keyboard, or the paddles, to send CW. The Winkey sidetone is generated locally on the client laptop and so sounds really nice with keyboard sending although it is better to use the sounder in the USB Winkey when using paddles as then there is no distracting delayed sidetone.

Using an iPhone with an IC-9700 (and an IC-7610)

On a previous slide showing "making the system robust", there is a connection shown called "subnet". This is a feature of Tailscale where a Raspberry Pi connected to the router creates a secure subnet which means you can connect to anything on your home network with a local IP address from elsewhere on the internet. For example my IC-9700 appears as 192.168.73.104 on my home network and that address is also available when running the Tailscale app on my iPhone (remember to avoid using 192.168.1.xxx).

The iPhone app "SDR-Mobile" from Marcus DL8MRE, works perfectly with my IC-9700. I also control my rotator from my iPhone, but that is for another day.



Software and hardware used

The desktop PC is a Dell Optiplex i5 running Windows 11 Pro
The laptop is a Dell Vostro 16" screen i5 running Windows 11 Pro, both direct from Dell

The USB headset is a Logitech H390, TP-Link AC1200 4G+ routers, GeekPi Raspberry Pi relay board, APC 650 VA UPS and the tapo P110 remote switches are all from Amazon

The power supply for the radio is an SEC 1235G

Winkey from K1EL or Kanga UK https://www.kanga-products.co.uk/
RemoteCW https://df3cb.com/remotecw/
SDR-Mobile https://roskosch.de/sdr-control-mobile/
Win4Icomsuite https://icom.va2fsq.com/

Tailscale https://tailscale.com/

TeamViewer https://www.teamviewer.com/en/

And finally…

While I have mentioned Win4Icomsuite as the software that I currently use to control an IC-7610 and an IC-9700, similar software is available for other brands.

By using a PC at the home site, it makes for easy configuration of a secure network connection as Tailscale provides Wireguard end to end encryption for your virtual network.

The remote power switches provide a means of turning your power supply on/off and a means of restarting the PC if you remotely shut it down. The IC-7610 and IC-9700 can be switched on/off by software command over USB.

As routers can sometimes need a power cycle, consider using the Raspberry Pi "ping" solution to automatically power off/on the router if there is a problem. Note that using a pre-boot PIN with Windows Bitlocker will prevent your home PC running if there has been a power interruption.

Don't forget to set the time out timer in your transceiver(s), typically set at 5 minutes.

Remember the clash of ports (50001/2/3), if using the default Icom ports and AnyDesk. In that case change the ports in the Win4Icomsuite software to a higher number such as 50004/5/6