N4PY Client-Server Remote Operation

Introduction

There are two ways to do remote operation of a radio using N4PY software. The way that has been done previously is to use any remote desktop program such as VNC or TeamViewer and simply operate the N4PY program remotely. Of course, if you are using a Tentec Omni VII, then continue to use it remote without using a computer at the radio location. The Client-Server feature is not needed for the Omni VII.

All N4PY programs now support a feature called Client-Server. This feature allows you to run two copies of the N4PY program on two different computers. Under my pricing scheme, there is no additional cost for the second copy. One of these computers has a serial connection to the radio and is called the radio server. The other computer is the one where the operator is located and is called the operator client. You control the radio from the operator client computer. The N4PY program then sends and receives information to the radio server computer. Remote control is then accomplished without the direct need for a remote desktop program. This has some advantages over a remote desktop setup. Namely, you can use a logging program connected to the N4PY program directly at the operator client computer and you can use a K1EL keyer connected to the operator client computer to send CW from the client to the server using paddles. Also, the operation using client-server is smoother and faster than when running a remote desktop setup. This is because you eliminate the slow screen re-draws that require large bandwidth.

The two computers (PCs) are linked to each other over a network. The network can be a local home network or the Internet. This means the two PCs can be separated by a few feet or many miles. For purposes of this document, the local PC is designed as the operator client (or just client) while the remote PC site is designated as the radio server (or just server). The server is connected to the radio while the client controls the radio over the network. The server and client PCs are connected to the network through a router. Depending on the type of network connection, a cable modem or other network interface may be included. The server PC connects to the radio through a serial interface. The client PC is protected from the network by a software firewall.

On top of this hardware is N4PY software that makes the whole thing work. N4PY software running on the server PC is in charge of sending commands to and retrieving status from the radio. N4PY software running on the client PC presents a graphical representation of the radio's controls so that frequency, mode, gain, and other functions can be easily adjusted remotely. In all respects the user feels that they are sitting in front of the actual radio.

Also, the Client-Server feature will automatically stop transmit if the connection between the client and server is lost. This helps prevent finals from over heating and also meets the FCC requirement 97.213(b) if a connection is lost during transmit.

IP addresses, Ports, and Port Forwarding Overview

Every computer on the internet has to have an address so it can be found. But there are not enough IP addresses such that each computer in the world can have a unique address. So what has been decided upon is to just give each router in the world a unique address.

So your router will have an IP address that identifies that router to the world and it will be the only router in the world with that address. For this discussion let's say your router has an IP address of 66.16.1.58.

Now your router will make a local area network of its own. And all the addresses for all the computer in your home connected to that router will start with 192. These local addresses are not unique but they are unique in your own home connected to one router.

Let's say you have a program named ABC on your computer and your computer's address is 192.168.1.120. Now let's also assume that this ABC program will talk on port 2500. The port inside the computer is used as an address for that particular program. So messages that get to this computer for port 2500 would be sent to program ABC.

So if another computer some place else in the world wanted to send a message to your ABC program, it would send the message to your router at 66.16.1.58 for port 2500. Your router would receive this message but would not know what to do with it. That's where port forwarding comes into play. You would have to go to your router's setup and tell your router that messages for port 2500 go to your main computer at 192.168.1.120.

Now when your router receives a message that was sent to 66.16.1.58 for port 2500, it knows to forward that message to the local computer with address 192.168.1.120.

Then when your computer receives this message, it knows that port 2500 is for program ABC and sends it to program ABC.

So think of it this way. The router's IP address is like a zip code for a post office. Your router is the post office. The port is like a mailbox and tells the router what computer to send it to if you have done port forwarding for this port on the router. And the final computer knows what program to send it to by the port value.

Physical Connections

On the server side, you setup your radio and N4PY software normally with a serial port connection. You will also need to make audio connections from the server computer sound card to the radio. Generally, the radio speaker out goes to the sound card line in and the sound card line out goes to the radio mic in. On the client side, you will need a microphone connected to your sound card and possibly a K1EL winkey or winkey II keyer that uses a serial or USB port. A network connection, of course, is a requirement. This is the complicated part of the setup and will be covered next.

Network Setup

First of all we need an IP address. All devices that communicate over the Internet have an IP address. It is the means by which you specify who you want to communicate to, and in some ways it is similar to a telephone number. If you are a client, you need to know the IP address of the server you want to connect to. Most home network connections use a leased IP address that can change from time to time. Some folks are lucky enough to have a fixed (static) IP address but this is rare and expensive.

When you connect to your IP service provider, a dynamic IP address is issued by a DHCP server. Once you have your address anyone can connect to you but if the DHCP server decides to renew your lease with a different address you are out of luck. No one can reconnect to you until you let everyone know what your new address is. This is very inconvenient ! Fortunately, there are free services that will do this for you. They keep track of your dynamically assigned IP address and handle when it changes. A couple of services that do this are www.noip.com and www.dynDNS.com. The way they work is: you pick a URL name such as n4py.hopto.org and this is the named IP address that others will use to connect to your PC. The trick is that n4py.hopto.org doesn't really connect directly to you, instead it connects through, in my case, no-ip.com which always knows what your IP address is. It knows because of a tiny application that runs on the PC which notifies no-ip.com when it's IP address changes. It is a great service and makes remote control over the Internet very easy. You can even go so far as setting up you own network webserver and do it without a static IP!

Getting back to the task at hand, let's assume that you have setup your server and have its IP address. This will be the address that N4PY, running on the client side, uses to find the radio server and connect to it.

One point that confuses many folks is intranet IP addresses versus extranet addresses. If you are running a home network with a router, the router acts as DHCP server for the individual PCs on your home network. These addresses usually look like 192.168.0.1 and are the IP address on your local network and have no correspondence to IP addresses out on the Internet at large. The home router is what connects to the outside Internet and it answers to the Internet IP address. It translates the IP address over to your local intranet IP addresses.

To find your extranet IP address go to

http://whatismyipaddress.com/

To find your intranet IP address go to the Start menu, then Run and type "cmd" and enter and at the DOS cursor type "ipconfig" and press enter.

This brings us to the concept of ports, in addition to an IP address, a port address identifies a particular kind of traffic and is used to direct the traffic to a specific place. This allows you to have hundreds of services on your local intranet addressed through one Internet IP address. To summarize at

this point, the IP address defines a specific location like a phone number. The port defines a specific program at the IP address like a phone number extention. N4PY uses 17152 as its default port. You should normally leave this alone unless you get an error indicating there is a conflict. If you need to change this port number, change it on both the server and client side and make sure they are both the same value.

In my configuration, I have several services directed to "home-computer" which is my ham radio station PC. I use VNC to be able to remotely take control of my station PC, more on this later. VNC uses two ports, 5800 and 5900. Finally I have selected port 17152 as the path for traffic sent to N4PY software running on my station PC. The actual port number is not important as long as both server and client use the same one and it is not a port used by some other service. So at this point port forwarding has been taken care of which means that traffic destined for the N4PY application will be sent to the correct place on my local network. In the case where you are not using a router but have a direct connection to the Internet from your PC, you will skip this step since N4PY traffic will come directly into your PC on port 17152 (or whatever port you decide upon). When you setup your router to port forward 17152, select TCP as the port type. The application will be ICOM for the Icom program.

Windows Firewall

There is one small detail that you must take care of before going any further. If you have a firewall enabled on you PC it will have to be configured to allow traffic coming in on the N4PY port (17152 in my case) to be passed through. You can do this by going to the Control Panel and clicking on Security Center. From the Security Center click on Windows Firewall. First of all see if the firewall is turned on, if it isn't on you can skip this step since your N4PY traffic will not be blocked if there is no firewall. Otherwise click on Exceptions and click on Add Port. In the name field enter the program name and in the Port field enter your N4PY port number (17152). The program name is ICOM for the Icom program. Also, the port type is TCP.

Install N4PY

The N4PY program must be installed on both the server and client PCs. It is simple to install, just follow the setup instructions. I always make a desktop shortcut to make it easier to find and start. If you already have a non-remote setup on the computer, then select a different folder to install your copy for remote operation on each computer.

Remote CW Operation

If you are going to use remote CW operation, you must have a K1EL winkey keyer at least at the server. This will allow you to type characters from the keyboard at the client to send CW at the server. If you want to send using paddles, then you must also have a K1EL winkey keyer at the client.

In summary, see the following matrix:

	K1EL at Client	K1EL at Server
No paddles for keying desired	No	Yes
Want to key with paddles	Yes	Yes

Configure N4PY

Start the server side of N4PY first and go to the "Interface" window of the settings menu. Here, select your radio type, baud rate, and comport number. Once you have these properly setup, exit the program. Now open the icom.ini configurtaion file. This file is in the folder where you installed the N4PY program. The default for this is c:\n4pyic. Once you are seeing this file, find the line that says:

RADIO SERVER=0

and change it to

RADIO SERVER=1

Then save the change.

Now start the radio server version. You should immediately see "Radio Server" in the left hand side of the "Interface" window. If you don't, then check your INI file change. You should see it connect to the radio, there should be a port number visible in the Interface window, and you should see "Waiting for Connection" at the top center of the program radio window.

On the server side, there are really only 2 settings windows that matter. They are the CW settings window and of course the Interface window. If you are going to be using a K1EL keyer on the client computer and not using a K1EL keyer on the server computer, then do NOT configure a K1EL keyer on the server side. If you have two K1EL keyers and are going to use one on both the server and client, then configure the server for a K1EL keyer. The server should also be set for "No Spd Pot" turned on to allow the speed to be set from the client. PowerSDR or using a second radio as a sub-receiver cannot be used with the client-server feature. Please note that with Icom and Yaesu radios, in order to send remote CW, a K1EL keyer is required at the server side.

Client Side

Start the client side of N4PY next and go to the "Interface" window of the settings menu. Here, only select your radio type. Once you have this setup, exit the program. Now open the icom.ini configurtaion file. This file is in the folder where you installed the N4PY program. The default for this is c:\n4pyic. Once you are seeing this file, find the line that says:

OPERATOR CLIENT=0

and change it to

OPERATOR CLIENT=1

Then save the change.

Now start the operator client version. You should immediately see "Operator Client" in the left hand side of the "Interface" window. If you don't then check your INI file change. There should be a port number and Radio IP visible in the Interface window, and you should see "Trying to Connect" at the top center of the program radio window.

On the client side, all the settings windows are important. Setup the Radio IP with the correct IP address or name that you have from noip.com. Once you put in the correct IP name or address, you should see the program connect to the server. It will say "Connected" at the top center of the program radio window. If you are going to use a K1EL winkey keyer on the client then configure it along with its comport in the CW settings window. Please note that currently there is no remote implementation for second radio support for LP-Pan, powerSDR panadapter, or sub-receiver. Of course, there is full support for a built in sub-receiver such as the Icom 7800 has.

When the server side connects to the client side, the server side program radio window will disappear, indicating that control has been transferred to the client side.

If you were not able to connect it could be one of many things. First of all make sure you have port forwarding setup if you are using a router. This applies only to the server side.
Next check that the firewall settings are correct. Insure that the IP address you are using is correct. If you are using a service like no-ip.com you will enter the named IP address since you do not know what the numeric IP address is. Usually you would only enter a numeric address if it was a static IP. A numeric address looks like this: 24.123.27.98 while a named address looks like this: n4py.hopto.org.

Keep in mind that the N4PY server side will not attempt to connect to the network if it can't first initialize its radio so that is something you need to check.

Remote PC Access

There is one facility that you must have, the ability to access your server PC over the Internet. There are several ways to do this. First is the Remote Desktop feature built into WindowsXP. Others are VNC, TeamViewer, LogMeIn, etc.. The downside of Remote Desktop is that the server end station must be running the Professional version of XP. VNC is free and doesn't care about what version of XP or Vista you run. I use TightVNC which works great. I run it as a VNC server on the server PC and run it as a viewer at the client. I can connect to my remote PC and actually see its display and be able to move the mouse around and run the keyboard as if I was sitting in front of my server PC. This allows me to start N4PY on the server PC and check settings etc. I can also look at the server router configuration as well.

Station Audio

It doesn't do any good to be able to transmit on a remote radio if you can't hear the remote audio. Routing real time audio from the

server station to your local PC over a network is challenging but not impossible. There are at least three ways to do this, namely IPSound, Skype, and Google Talk. These are essentially free Voice Over IP (VoIP) services that allows you to call another PC over the Internet and connect to it. Once connected you can hear on your local speaker what is fed into the server PC's microphone input. So if you feed the radio's audio in the server PC's microphone jack your can hear the transceiver audio in near real time. Mission accomplished. The setup for both services is similar;
you will need to establish an account with email addresses and passwords. You will need two user names, one for each end and you will have to set the server site to run in auto answer mode. This allows you to dial the server PC, have it answer, connect, and then serve audio. The connections are long lasting. Once you are connected you can stay connected for hours provided there is audio activity. The audio path from the client PC to server PC is also provided allowing you to talk back to the server PC. This would be used when running phone. In CW mode this path is not utilized. Once you start N4PY on the server side and Skype, you can quit the remote desktop program to speed up the connection.

Starting with version 3.00, there is now an automatic connect for IPSound in the N4PY program on Windows XP only. This means that for Windows XP, no configuration at the client side for IPSound is required. The only configuration is at the Server side. At the client side, you can even configure IPSound to start automatically. In the icom.ini configuration file file, find the line:

AUTO PROGRAM START=

and also

AUTO PROGRAM START FOLDER=

Set both these lines to the values you see by right clicking on the IPSound Icon and then selecting properties. For my Windows XP computer, these are the values I have:

AUTO PROGRAM START=c:\program files\sm5vxc\ip-sound\ipsound.exe
AUTO PROGRAM START FOLDER=c:\program files\sm5vxc\ip-sound

For my Windows 7 64 computer, these are the values I have:

AUTO PROGRAM START=c:\program files (x86)\sm5vxc\ip-sound
\ipsound.exe
AUTO PROGRAM START FOLDER=c:\program files (x86)\sm5vxc\ip-sound

Once you put these two lines in, the client side when started will also start IPSound. Then when you exit the client side, IPSound will be automatically exited. And as soon as you connect to the server, IPSound will also automatically connect.

Remote Mirrored Radio Operation

There is a remote operation for Icom radios that allows two identical Icom radios to operate in a mirror fashion. In order to do this, you need a pair of identical Icom radios. You use one at the server location and another one at the client location to

control the server radio. At the operator client location, whatever you do to the radio controls is mirrored at the server radio.

The client radio is continually polled for changes to send to the server radio. Because there are almost 40 different settings that are continuously polled, it can take as long as 4 seconds for the change to be seen by the client program and sent to the server. Some high priority items such as frequency and mode are polled much more frequently. And it is important to understand that in the case of the IC-7800, only the main or sub can be polled (and not both at the same time) according to the setting of the "Polling MAIN" button in the "Mirror Control" window. And likewise, for all other radios, the VFO frequencies for either VFO A or VFO B (and not both) are polled according to the setting of the "Polling VFO A" button.

To turn this feature on, a setting in the icom.ini file for the client is required. Open the icom.ini configuration settings file and find the line that says:

MIRROR=0

and change it to

MIRROR=1

then save the change.

As soon as the client program connects to the server, polling of the client radio begins. Almost no operation is done from the N4PY client program. There are just a few exceptions to this and they are all handled in the blue "Mirror Control" window. If this window is not visible, click the "Mirror" button at the top of the program. This window has buttons for the following operations:

"Polling MAIN" or "Polling VFO A" - This button controls whether the main receiver or sub-receiver or VFO A or VFO B is polled for changes to send to the server. For the IC-7800 this button either says "Polling MAIN" or "Polling SUB". For all other radios, this button either says "Polling VFO A" or "Polling VFO B".

This button is only active when either dual watch or Split is active. When polling the SUB or VFO B, the button will say "Polling SUB" or "Polling VFO B". If you make changes to the main receiver or VFO A, they are only polled and picked up if this button says "Polling MAIN" or "Polling VFO A". If you make changes to the sub-receiver or VFO B, they are only polled and picked up if this button says "Polling SUB" or "Polling VFO B".

"Dual Watch" - This button is used to turn dual watch off and on. Either this button or the Split button must be on for the "Polling" button to operate.

"Split" - This button is used to turn split mode off and on. When split is first turned on, the polling button will automatically change to SUB or VFO B for 5 seconds to allow everything to be picked up from the SUB or VFO B and then revert back to polling MAIN or VFO A. Either this button or the Dual Watcht button must be on for the "Polling" button to operate.

"Transmit" - This button is used to go into and out of transmit mode. It turns red while in transmit and goes back to black when in receive. You can also use the computer keyboard space bar as a PTT button as long as you are not in CW mode.

"PwrMtr" - This button controls the meter type that is read from the server radio while in transmit mode. It can be set to "S Meter", "PwrMtr" for reading output power, "SWRMtr" for reading SWR, "COMMtr" for reading the value of compression, and "ALCMtr" for reading the current ALC value.

"Tuner On" - This button is used to start a tuner cycle at the server radio.

"Tuner Off" - This button is used to put the tuner at the server radio in bypass mode, effectively turning it off.

This is VERY IMPORTANT! On the client control radio, you must never use the DUALWATCH button, the SPLIT button, the MAIN button, the SUB button, the TRANSMIT button, or the TUNER button. The buttons in the blue "Mirror Control" window are used exclusively for this.

Using the LDG AT-200PC Autotuner Remotely

You can also use the LDG AT-200PC in a client-server setup. Configure both the server side and client side identically for the LDG AT-200PC in the "Transmitter" settings window. The controls for the tuner in the client side will then control the tuner that is hooked up on the server side.

Using an Antenna Rotor Remotely

If you have a rotor that uses the HyGain DCU-1 serial protocol, you can use rotor control remotely. Configure just the server side for the rotor control by setting the ROTOR COMPORT value for its comport in the INI file. This will allow the rotor to be controlled from the client side either in the "Call Sign, TopTen" settings window or the beam heading button in the check window of the N4PY DXSpots program.

Logging

With the client-server feature, it is best to run logging programs in the operator client computer. They can be connected to the N4PY program through the Tentec file interface or the third party logging interface.

You can also run logging programs in the radio server computer with either interface but the function is limited. The logging program can only read frequency and mode information from the server program. It cannot set frequency and mode to the server since the operator client computer is the one that is in control of the radio.

K1EL Winkey Keyer Emulation

If your third party logging program supports the K1EL winkey keyer, you can get it to send its CW messages to the N4PY program. This is done through K1EL keyer emulation in the N4PY program. This is great to setup in the client program and allows contesting programs such as N1MM and WriteLog to send their CW messages to the N4PY Client program for forwarding to the N4PY Server. For complete setup details, see the "Third Party Logging Programs" section of the N4PY Help file.

Using the hamShack switch with N4PY software for remote operation

The hamShack switch can be used for full remote operation with N4PY software. There are just a couple of parameters to setup for this. In the Icom.ini file, find the line

REMOTE SWITCH=0

and change it to

REMOTE SWITCH=1

then save the change.

In the hamShack program, first configure hamShack fully for normal operation. Then turn on the setting "Connect Remotely via N4PY" and then exit and restart the hamShack program. It is important that the N4PY program be fully connected and running before starting hamShack. If this is not done, messages from hamShack to N4PY will be lost.

Reboot Persistence

Often times a PC will reboot unexpectedly. A power outage, hardware instability, or the dreaded Windows Update auto restart. It's a good idea to set the PC up so that it reboots into a useful state from a remote control point of view. First of all, when you install the no-ip address update application, set it up as system level application. That means it will automatically be started on reboot. The same applies to TightVNC. This insures you will be able to remotely access your PC to set things up again. You may even have a BIOS setting that you can turn on that will cause your computer to reboot automatically after a power outage.

Wrap Up

That concludes this quick start guide to setting up N4PY client-server I have simplified the network aspects and have glossed over some of the technical details. More information is freely available about the software packages mentioned in the article.

Here links to the applications:

Skype: http://www.skype.com/
GoogleTalk: http://www.google.com/talk
TightVNC: http://www.tightvnc.com/
TeamViwer: http://www.teamviewer.com/
No-IP: http://www.no-ip.com/

DynDNS: http://www.dyndns.com/

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