Newcomers and Elmers Net: Remote Operation Robert AK3Q
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Remote operation sounds rather exotic when it comes to radio – the thought of being able to have a station one place and work through it in another seems pretty complicated
-- fortunately, with advances in speed in the Internet, the audio capabilities of almost any computer, and a lot of well-written software, remote operation is not a big deal these days
-- that is not to say that it does not require some effort and detail in setting it up, but it does mean it is in reach of the average ham

Why Remote Operation?
There are a number of reasons why remote operation might make sense
-- many places have antenna restrictions which prevent any outdoor antennas
-- living facilities might not allow for even an indoor antenna
-- urban dwellers may simply have too much noise to operate on one or more bands, especially those in apartments or condo
-- more and more electrical devices in the home such as TVs, cable boxes, wall warts, light switch dimmers, wireless and wired routers, furnaces, thermostats, washers/dryers/refrigerators and on and on may cause interference
-- in some ways it is a wonder we can operate at all!
-- and even though we are supposed to be protected from interference as licensed operators, the sad truth is, government has done a rather poor job of enforcing Part 15 (non-interference) requirements
-- and of course, one may want to operate remotely just because they can!

In fact, there are several commercial and non-commercial outfits who either sell or volunteer remote hosting services
-- just in the last month or so I have talked with several folks using such services; one fellow was in Australia operating through Florida, while another was in Europe operating out of New York
-- one of the advantages to operating remotely is access to locations and propagation conditions which might not be accessible otherwise
-- for example, there are western parts of the country which simply cannot hear most European stations without a serious antenna setup due to mountainous regions and the sheer distance involved
-- a remote station on the east coast would allow someone in Arizona to talk with hams in Europe

-- Another possibility with remote control is using your station while on vacation or the reverse—a cabin getaway may have a station you want to control from home
-- and of course, you could allow others to use your station while you are away; perhaps some ham friends are in tough operating conditions, you could help out
-- so there are a lot of reasons for remote operating, sometimes referred to as ROIP, or radio over IP

In a way, remote operation is taking the Echolink, DStar, and IRLP VOIP principles and bringing them to the individual station
-- some of the same technology and software can be used for remote operation as for digital and VOIP modes—sort of a combination of the two
-- In remote operation you are using the Internet to pass commands back and forth between a radio and a computer/Internet connection; and in fact, the computer control capabilities we use to control our rigs in the home can work for remote operation
-- in remote operating we refer to the transmitting station as the host; it is the computer/radio combination which is last in the chain and which actually sends a signal out over the air
-- the station/location connecting to the host is referred to as the client (similar to computer terminology)
-- the host site typically has a transceiver capable of a computer connection, a computer, host software, and an Internet connection
-- a remote station has a computer, a microphone/speakers or headset for voice operations (or a keyer for code), client software, and an Internet connection

The transmitting station can be HF, VHF, UHF, voice or code or both. The radio just has to be able to communicate with the computer in both directions
-- the computer polls for data from the radio, meaning it reads the settings of the radio depending on the capabilities of the radio
-- things like frequency, filters, transmit and receive states can all be sensed by the software and communicated to the computer
-- using audio cables to the computer the radio can receive the incoming audio from the client station and transmit it over the air, and in the reverse process send received audio through the host out over the Internet to the client station
-- thus by using the client side software the user can send frequency changes, filter settings, and almost any command needed by the host station to control the radio just as if they were sitting in the same room
-- BTW, the host computer does not need to be a power station—almost any computer capable of running the host software will be powerful enough to

act as host—you are only using relatively small amounts of data to control the radio—it is doing the real work, not the computer (unless you are using an SDR radio for the host—then the computer has to be good enough to run the SDR, but that is a given)
-- an external sound card device would be the only optional (but recommended) add-on; these are available for $100 or so for commercial products, or you can build your own
-- the advantage to an external card is that it take the load off of the internal sound card, and eliminates the risk of audio conflicts once it is set up properly
-- most host software is written for Windows, but there are options out there for Linux and Apple
-- another cost saver is that the host station does not need a display monitor except when you are setting things up initially—that may save a chunk of change-after all, there won't be anyone there to be looking at it if you are logging in remotely!

You may be wondering about the legality of operating remotely
-- an analogy I read in an ARRL book makes good sense
-- if you have looked at mobile radios, newer ones at least, often the display head can be removed from the body so as to be mounted on a dash without taking up the room of a full-size radio
-- typically the body of the radio is in the trunk or under a seat, and it is connected to the head with a long cable
-- in this situation the body of the radio in the trunk is the host, while the control head on the dash is the client
-- in this case the wire connecting them is called the control cable; in the client/host setup we are discussing, the Internet is the long control cable
-- all the FCC cares about is proper station ID just like always, and that the client can control, especially shut down, the host if there is a problem, just like with any station

Internet Access
For purposes of our discussion here I will assume you know how to set up the Internet, how to get your computer talking to it, and how to use routers and IP addresses
-- speed of Internet access can be confusing, but in general, as long as you are on something higher than the old dial-up service, you should have adequate speed, unless there are other users using the network connection at the same time
-- even then unless there is a really high demand, the speed needed to use remote software is pretty low
-- likewise I am assuming you can get your software working properly, your computer connected to your radio, and the appropriate soundcard

connections made to allow the radio to communicate with the computer, and for audio to go into the client computer to be transferred over the net
-- if these are issues for you you will want to get someone to help who knows about such things, but the process is not really complicated
-- you just have to be sure you keep track of the details so that should you ever need to set things up again you will be ready to go
-- just keep in mind that firewalls, security settings, and router ports may cause problems that need to be addressed, but they are solvable! Sometimes things flow well, but often when there is a problem getting things to work, this is where the bottleneck is

Once you have your Internet access going and your radio talking to your computer, the hard part is over
-- soundcards have settings to control audio levels to the microphone, the line out, and the input lines which need to be set properly to work
-- this is the other likely bottleneck if you are having problems, but if you are set up already to use digital modes and they work, you are likely good to go with the remote software
-- most soundcard interfaces want a range of volume settings to work properly for TX and RX, and this will vary by manufacturer
-- the setup instructions will usually have all of the information you need to set things up properly, but just be aware that this is a possible problem source if you can't get things working properly

Antennas
While you can use any antenna you might normally use on a regular station, just keep in mind that antennas which need to be rotated must have connections to the host computer and software to receive control commands
-- many computer control software packages include rotor control, but this may be something you have to consider when putting up antennas at a remote site
-- the simplest antennas would be those which do not need to be turned, but often the idea behind getting to a remote site for TX is for better conditions, and you might want a directional antenna for the best results
-- the only difference between a home station and the remote is that the control commands will have to come thru the computer—you won't have a separate control like you might have at home
-- this will add considerable expense to the station, but may be well worth it if you can afford it
-- as for switching between multiple antennas, this can be controlled at the host station just as you would at home, but of course must be done electronically, rather than with a manual switch like you might use at home

-- all of this is part of the planning for a remote station, but certainly one can use a multiband antenna with an automatic tuner to accomplish this with minimal fuss

Audio

Finally, be aware that some remote control software comes with VOIP capability built-in, while others require a separate VOIP software program to be installed

-- if you are familiar with SKYPE you already know about VOIP, and some programs will use SKPE for the audio

-- basically either through the control software or though a separate VOIP program audio is going back and forth over the Internet

-- the main issue in terms of use is balancing the audio settings between the software and the radio to make sure 1)that your audio sounds good to the person you are talking to and 2) that you hear everything you want to hear on the receiving end

-- this may require a bit of tweaking and trial and error, as well as turning off some of the auto level settings common in VOIP software

-- this is all part of the setup process, but once set up properly things should work well without a lot of fiddling

In general, you must keep in mind that you need some way to shut things down if there is a problem in terms of what gets transmitted, and this can be a bit tricky

-- the question is do you take the chance that any problem with the computer or radio will not be transmitted over the air, or do you put a failsafe option in place to remotely shut things down?

-- ultimately that has to be your choice, but there are several options you can explore for remote termination; it will add to the expense, but might save other headaches down the road

Conclusion

Remote operating can be fun, something interesting to experiment with, or an option that can keep you on the air

-- you are likely to hear more and more people operating remotely as situations change for folks and regulations get tighter

-- but even if it is just for fun it might be something you really enjoy as another tool in the toolbox!