



# Understanding Remote Contesting

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# What IS Remote Contesting?

- Remote Contesting is operating your Amateur Station from a physically remote location, be it a few miles away or around the world, during a contesting event.
- You can do it as a single op, as a multi-op hybrid, with both local ops and remote ops, or, as a fully-remote multi with no one at the station.
- Typically, remote contesting is accomplished using the Internet as a transport. That's the subject of this talk. I'll concentrate on operating HF remotely.
- Technology is sufficiently advanced that a remote contesting system can vary from extremely simple to extremely complex, with great results at either end of the complexity spectrum. I'll show you examples.
- Different from casual operating or DXing remotely, remote contesting has unique challenges which must be overcome for successful results. I'll discuss some of those challenges in this presentation.
- Remote contesting is very compatible with almost all existing contests. For the typical Single-Op, Multi-single, and Multi-Multi categories, operating remotely is exactly the same as being at the shack.
- Remote Contesting is contesting with physical freedom.

# Why Contest Remotely?

- Your location is not good: local noise, proximity to or distance from populations, no real competition, or too much competition.
- You have antenna or travel restrictions/budget restrictions.
- You have no station of your own, and want to experience HF. (Club station, friends QTH, etc.)
- You travel a lot and don't want to lug a lot of gear with you.
- You want to operate a contest with others, but health restrictions are preventing in-person operation (COVID).
- Because you can: another adventure in the contesting game.
- To overcome the technical challenge.

# Is HF Remote Contesting Difficult or Expensive?

- Like many other aspects of the hobby, you can spend as much or as little as you want: the good news is if you do it right, you can expect your operating skill to determine how well you score, not how much you spend.
- When planning to operate remote, these are a few of the considerations:
  - What radio you will use.
  - What level of station automation you will require.
  - What type of Internet connection you have, and what interface technology to use.

(Cayman Brac, Cayman Islands, home of ZF9CW)

# What kind of Radio for Remote?

Almost any radio less than 30 years old will work for remote. All it needs to have is CAT control.

- That said, we are contesters. So – evaluate your radio choice for all other considerations before considering a purchase solely on a radio’s remote capabilities.

There are three classes of radios appropriate for remote operation:

- Radios built before Internet remote was a consideration. These radios must at least have CAT control. These radios can be put into remote service by adding hardware or simple software.
  - Radios built to support Internet remote, either through hardware and/or software mechanisms. Radios in this class include the Kenwood TS-590S/SG, the Icom 7300/7610/7800, the Yaesu FTDX series, and the Elecraft K3/K4 series.
  - Radios built from the ground up intended as Internet-based radios: Flex, SunSDR, etc.
- ALL of the radios mentioned are capable of delivering world-class scores while operating in a remote situation.

# Automation is the key to successful Remote Contesting. Period.

- If your station has manual antenna selection controls, a manually-tuned amplifier, and an old-fashioned rotor controller, you are going to have a rough time contesting remotely with any level of operator satisfaction.
- On the other hand, as an advanced contester, if you have automatic band switching via a band decoder, some stack-match switches, rf-relays that switch alternate antennas, and a modern rotator controller, you are in great shape.
- If you are in the later category, the next step is to get software and/or hardware to enable display of the above items on your computer desktop. Shop the DX Engineering catalog, or, if so inclined, write a bit of code and use off-the-shelf relay boards and rotor controller kits to automate the station.

# What about Internet Service? What do I need for successful remote contesting?

Almost any kind of Internet service will work for remote.

- There are three things to consider:
  - Latency
  - Jitter
  - Bandwidth
- Latency is the amount of delay present between the station and your remote location. Latencies between 60-150 mS are quite acceptable, and remote works with latencies of over a quarter second, but it's not that much fun. That said, latency does not affect your ability to break pileups - the determining factors are typically the skill of the operator and the performance of the station.
- Jitter is the instantaneous change in latency over time. In ham radio, we want our overall latency (Internet connection + encode/decode overhead) to be low. Therefore, we don't buffer as much. Jitter will quickly cause our buffers to empty, leading to audio breakup.
- Bandwidth is how "thick" your pipe is to the Internet. For really good remote operation, you don't need much. 800Kbps up and down will work just fine for a single station. However, you have to watch out for what is called "Bandwidth Starvation". Typically, you'll run other software when running remote. The combination of all components determines the needed bandwidth. If you starve your connection, you will not be satisfied.
- What ISP Technologies work best for Internet Remote?
  - Fiber and Cable work the best.
  - Cellular 4G/LTE/5G works well IF you have sufficient bandwidth. (800 Kbps both directions. Some radio technologies will require more.)
  - Point-to-Multipoint Wireless is the worst situation, and I've rarely had it work. Most Wireless ISPs using Time-Division Multiplexing to serve sectors from a Multipoint radio. During the "off" time, the latency and jitter goes infinite, and audio dropouts will occur. If you have a wireless ISP, see if you can get a point-to-point connection.
  - DSL is totally acceptable IF you have at least 800 Kbps of upload speed per radio. (upload is the determining factor, usually.)
  - Satellite, such as any LEO service like Starlink, will work excellent for remote hf operation. Geostationary services will not work as they have excessive latency.
- Bandwidth requirements will multiply in a multi-radio scenario. That said, I've operated very successful M/2 using Bonded DSL with 12 Mbps down and 1.2 Mbps up.

# The Bane of Remote: Your radios require a server connection.

- No matter the radio type, just about every remote connection uses what is called a peer-to-peer client-server model.
- In this model, your station is a server, and remote clients connect to the server. The address (IP address) or domain name must be known, and, it must be publicly accessible to the client.
- Understanding the network topology of the Internet, and the complexities of routing, the Domain Name Service, Network Address Translation (NAT) or Virtual Private Networking is beyond most hams. If the term Port Forwarding makes your stomach churn, it is best to find a networking guru among your ham buddies, and have them set up your network for remote. That said, there are some very good off-the-shelf solutions that will eliminate these remote headaches.
- The Flex guys understand this, so they offer the Smartlink Service, which essentially manages all of this complexity for you. However, many of us would like to use a variety of radios, and may not have Internet Service that Flex supports...



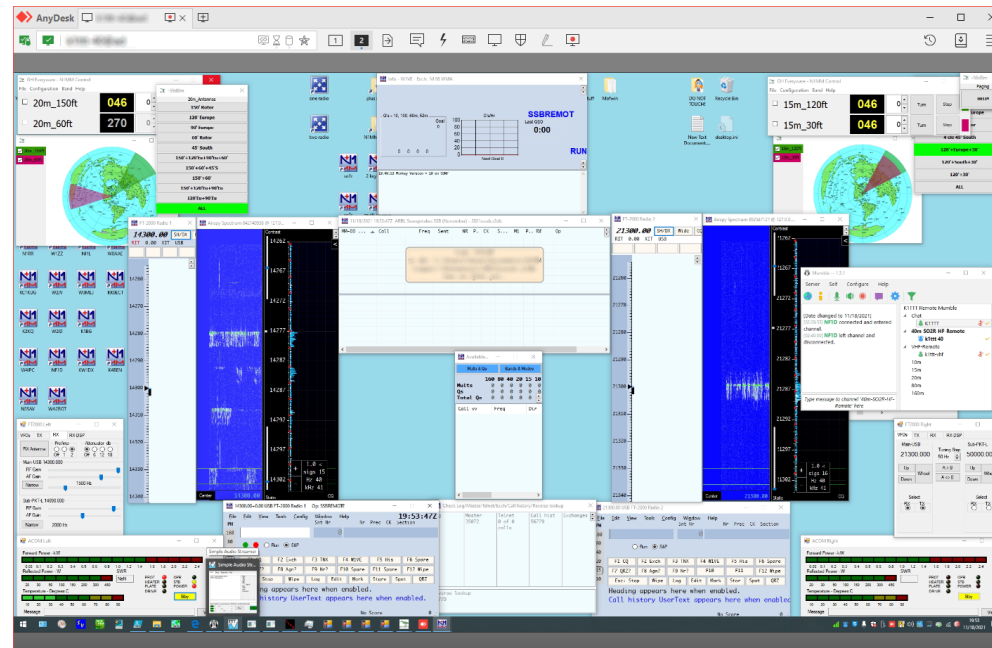
# Solving the server dilemma: Rendezvous Servers

- A Rendezvous Server is a known server on the Internet that has public access for all. It's purpose is to connect Peer-to-Peer applications (such as our remote client server peers). In this scenario, you simply point both your station and the remote clients at the same Rendezvous Server.
- The number one use of this technique is software applications that provide Remote Desktop capabilities between peer computers on the Internet. The most popular of these services are Anydesk, TeamViewer and Rustdesk.

# Anydesk as the Remote Desktop for Station Access

- Anydesk is a free download from Anydesk.com.
- Install Anydesk on both the Station side and Remote Side.
- Anydesk has configuration options to allow anytime remote access using a secure password. You can even set an “alias” for the remote-desktop address of your station, such as “w1ve@ad”

Here’s what Anydesk looks like when connected to one of the stations at K1TTT’s multi-multi. Remember I talked about automation being the key? Here you see The N1MM+ Logger, antenna switching, rotor control, rig control and even SDR panadaptor displays, all accessible via a simple Anydesk connection.



# Mumble as the Super-low latency audio gateway to your remote station.

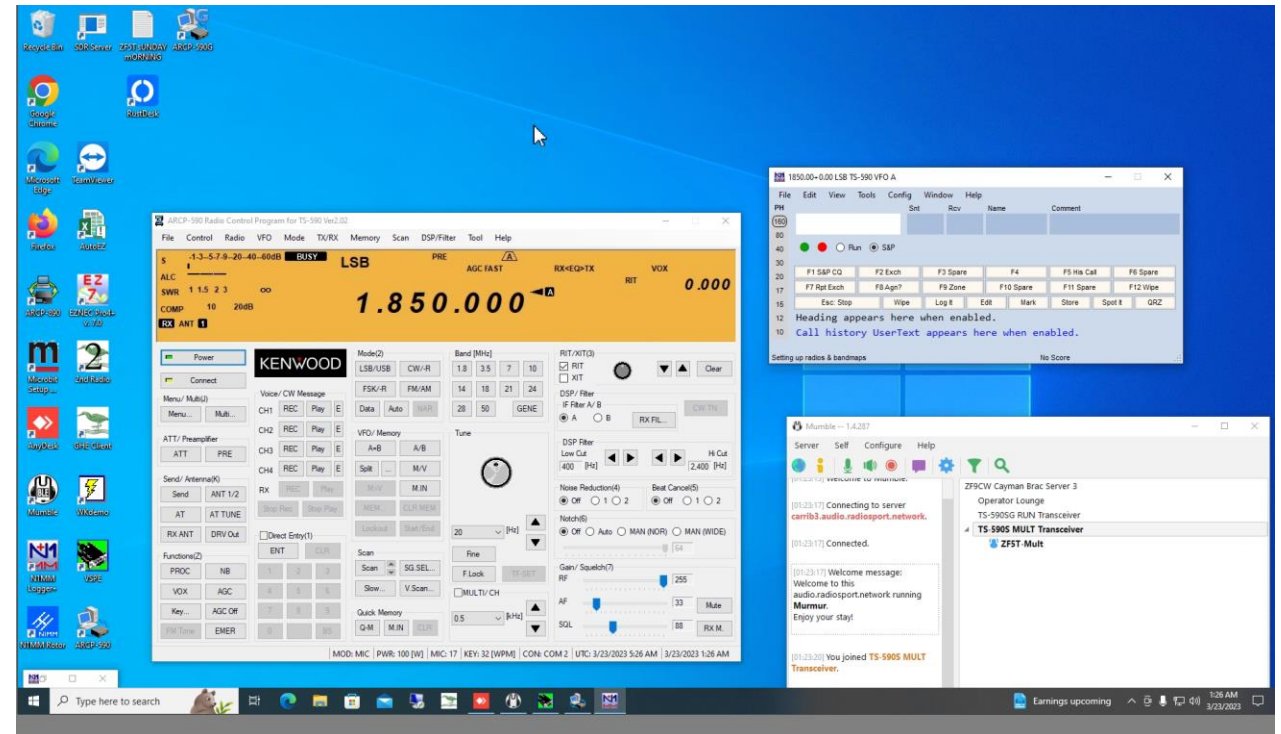
- Mumble is open-source audio conferencing client-server software developed by Internet real-time gamers.
- Mumble is available for a wide variety of operating systems.
- The mumble server and client software is free, and can be downloaded from Mumble.com.
- The trick for successful, very easy remote operation is to use Mumble as a Rendezvous server: Have your station and remote position connect to a publicly-known Mumble server. This has many advantages: it lowers the bandwidth requirements for multiple ops to join, and, no port forwarding is required.
- What I do is host mumble servers on very cheap Linux Virtual Private Servers, which you can lease for a few dollars a month. It is beyond the scope to discuss all that here. Check <https://lowendbox.com> for great deals on small linux VPS Servers. A good guide for installing a Mumble Server on Ubuntu is at <https://www.unixmen.com/install-mumble-server-ubuntu/>
- I have a complete guide to using Mumble for Remote available at [http://files.w1ve.com/Installing\\_and\\_Configuring\\_Mumble\\_for\\_Amateur\\_Radio\\_Remote\\_Operations.pdf](http://files.w1ve.com/Installing_and_Configuring_Mumble_for_Amateur_Radio_Remote_Operations.pdf)
- Don't want to wait? I have a large set of mumble servers for hams. Pick one that is close to you: na.audio.radiosport.network, arctic.audio.radiosport.network, west.audio.radiosport.network, northwest.audio.radiosport.network, and eu2.audio.radiosport.network. All work on the default port, with password **Demo!**

# Anydesk + Mumble: Easy. Fast. It Just works.

- Setup Anydesk to your station computer's desktop.
- If you are running Icom, Kenwood or Yaesu remote applications, run them on your desktop at the station, and control them over Anydesk. It is much less complex then networking devices.
- Use a Mumble server in my list or setup your own. (See the guide)

Here's the multiplier desktop at ZF5T. During This years ARRL DX CW, we finished top Low Power DX World (claimed). Here's a few lines from our CBS file. The Internet connection in Cayman Brac? It's Digicell 4G LTE!

Hour	160	Q	S	O	Rate	S	u	m	m	a	r	y	Rate	Total	Pct
0000	0	0	0	0	1	90	89	180	180	3.5					
0100	0	0	0	0	50	114	0	164	344	6.7					
0200	0	0	0	79	158	0	0	237	581	11.3					
0300	0	81	123	0	0	0	0	204	785	15.2					
0400	3	186	0	0	0	0	0	189	974	18.9					
0500	32	1	148	0	0	0	0	181	1155	22.4					
0600	69	69	0	0	0	0	0	138	1293	25.1					
0700	13	0	79	6	0	0	0	98	1391	27.0					



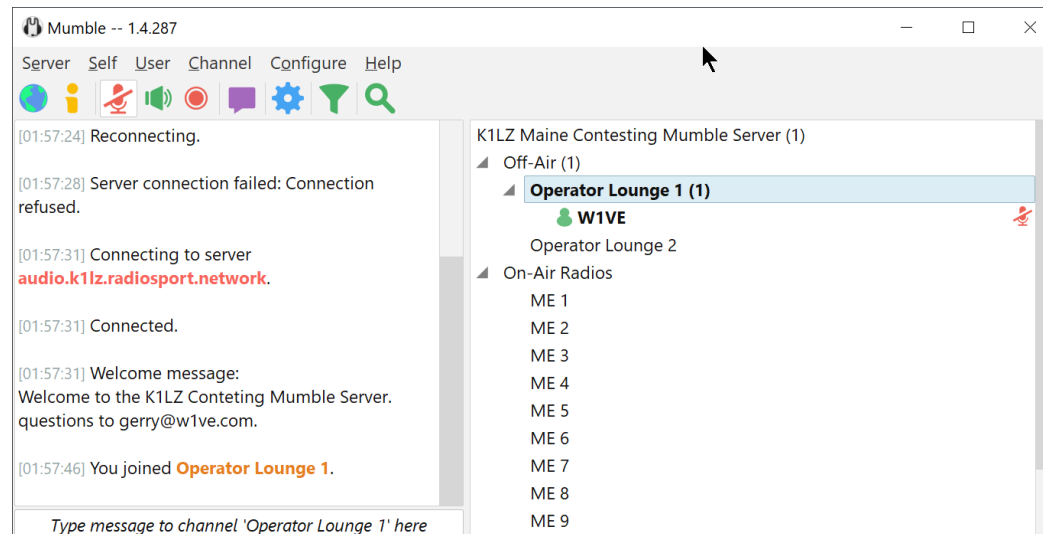
# The secret sauce of Remote Contesting Success: Simplicity

- In any serious contest endeavor, there is always a level of complexity. Adding remote to the mix makes it worse.
  - Engineer your remote to reduce complexity.
  - The Internet can be unreliable. A connection that drops for a few seconds can completely throw you off your game in the reconnection scenario is too complex:
    - Bad Example: N1MM+ Logger connected to SmartSDR-CAT + SmartSDR to remote Flex Radio. The Internet goes down. N1MM+ loses connection to the radio. SmartSDR-CAT loses its virtual ports. Essentially you have to bring it all down and back up in sequence to work properly.
    - Good Example: Your Anydesk Connection Drops. Your Mumble audio drops. You immediately reconnect Anydesk and have control. Then, you reconnect Mumble and have audio. Downtime limited to a few seconds.

# Remote Contesting Multi-ops: Communication is key

- One of the most important factors for multi-ops is inter-operator communication: in-band coordination, passing, band changes, talking strategy.
- In a hybrid or completely remote scenario, you can't tap the op sitting next to you on the shoulder. However, there are a bunch of techniques that work really well:
  - Mumble can have many channels. Some can be set up for Operator chats. In addition, the Mumble interface offers a text chat window.
  - Out-of-band text and audio chat applications such as WhatsApp or Telegram are very reliable and provide another channel for communication.

Here's the Mumble Server K1LZ used during ARRL DX CW, where 9 of the operators were remote:



# Reference Material

- Mumble: <http://www.mumble.com>. Lots of online documentation for setting up both a sever and the client. (both your station and operators are clients.)
- Anydesk: <http://www.anydesk.com>. Be sure to download the free version. Install Anydesk, and set a password for remote access. Anydesk allows setting an alias, which is easy to remember. Most of us set it as your callsign. Then, connecting is as simple as entering callsign@ad.
- RemoteRig: details available at <http://www.remoterig.com>.
- DF3CB Yaesu control software (free) <http://www.df3cb.com>.
- WFView free Icom control software: <http://wfview.org>
- N1MM+ Logger, great for remote access, <https://n1mmwp.hamdocs.com>
- See my Remote Contesting articles in National Contest Journal. I cover many topics related to remote operating and station building.

# Contact, Questions

- Email me anytime: [Gerry@w1ve.com](mailto:Gerry@w1ve.com)
- Questions?