Newcomers and Elmers Net: Echolink, IRLP, and D-Star
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Echolink
All you need is a computer connected to the Internet and EchoLink software.
-- EchoLink enables hams to connect to one another over the internet using Voice Over Internet Protocol (VoIP).
-- In its simplest configuration you connect your computer to the internet and run an EchoLink software program.
-- Your destination, selected from a list in the software, can be any of several thousand other EchoLink users in over 100 countries of the world.
-- With the computer's built-in microphone and speakers or a headset you can talk with other EchoLink users.
-- (An iPhone with an EchoLink App can be used in place of a computer.)
-- Where it gets interesting is how people on the other end can talk to you.
-- Depending on what type of station you connect to they can be talking over an RF link via an HT or base station to their local repeater.

Here's an example:
-- you have a ham friend on the East Coast who wants to talk to you. She does not have a 2-meter transceiver but does have a computer with an internet connection.
-- She decides to give you a call so she runs her EchoLink software and selects K4TCD-L from the list of active EchoLink stations in the US Area.
-- In a few seconds she's connected to the K4TCD-L node in KY. You're out doing errands and hear her call you "WB8APY this is W1XYL over."
-- You respond as you normally would answer a call from any other station on the local repeater and have your QSO
-- you can also initiate a connection to a node anywhere in the world from a transceiver, instead of a computer, using your local repeater, if there is an EchoLink node within range of that repeater.
-- Think of the example as a computer-to-RF link. This alternate method would bean RF-to-internet-to-RF link

Getting started
-- Go to the www.echoLink.com website and download the EchoLink software program and follow the instructions.
-- You will need to validate and authenticate your callsign before you can use the software. If you're planning to only use EchoLink from your computer you can register for Single-User mode, so you won't append either an L or an R to your registered callsign.
-- Once you have all this in place you can run the EchoLink program and try connecting to one of the listed nodes

-- if using a radio, you will need to know the local echolink repeater node number (e.g. **Echolink Node and Call:** K4TCD-L Node: 932415)

IRLP
-- IRLP operates a worldwide network of dedicated servers.
-- The IRLP uses a Voice-Over-IP (VoIP) streaming software called Speak Freely. Speak Freely is very similar to other VoIP software packages (such as Microsoft NetMeeting and VocalTec iPhone) but it runs under Linux.
-- Linux is the operating system of choice for the IRLP system as it allows the best in reliability, programmability, efficiency, and functionality.
-- Effective March 2007 IRLP started shipping an open sourced CentOS version of Linux. This release provides greatly improved operation with more support for audio cards

The concept of IRLP's use of VoIP is as follows:
-- Sample the audio using an analog to digital (A/D) converter. The A/D converter used by IRLP is the input source of a standard PC sound card. This creates a continuous mono 16-bit digital stream of raw audio at 8000Hz (120000 bps).
-- Compress the audio by downsampling the stream and using an 4-bit ADPCM algorithm to reduce the size of the stream by a factor of four (32000 bps)
-- Split the sample into small chucks (or packets).
-- Transmit the packets to the remote host using a User Datagram Protocol (UDP) stream. UDP does NOT confirm the reception of packets, so it uses a "fire and forget" method.
-- Receive the packets on the remote host.
-- Join the split packets back into a 4-bit ADPCM stream.
-- Uncompress the ADPCM stream back into an 16-bit raw stream of audio. Play the raw audio stream through a digital to analog (D/A) converter (the output device of your sound card).
-- The control software controls the stream using carrier operated squelch (COS) or continuous tone coded subaudible squelch signals (CTCSS) to start and stop the stream. When COS is present, the computer detects it through the IRLP interface board.
-- The PTT is controlled by the buffer which joins the split packets back into the audio stream. The IRLP interface board receives a "transmit" signal from the computer while there are packets in the buffer, and a "unkey" command when the buffer is empty.
-- The user interfaces to the IRLP computer using DTMF signals sent over the radio. DTMF sequences are owner programmable, and can accomplish almost any function imaginable.

-- The DTMF signals are detected on the IRLP interface board and sent directly to the computer in binary, where they are converted into numbers. A DTMF software program then runs commands on the computer depending on the code entered.
-- These commands are what start and stop Speak Freely, basically establishing and breaking the link.
-- And that is, in a nutshell, how IRLP works. --- David Cameron IRLP Designer VE7LTD

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D-Star
DStar for amateur radio has digital voice and slow and high speed data communications
-- slow speed data voice is transported at 4800 bps with 3600 bps being used for voice and error correction
-- the remaining 1200 bps is used for synchronization
-- in general use of this 1200 bps, about 900 bps is available for transporting data
-- high speed data communication is transported a 128 kilobytes per second and supports internet packets; it is fast enough even for Internet applications; however this is used only on 1.2 gigahertz
-- connecting repeater site over the Internet, you can form a worldwide radio network
-- the Dstar voice transmission is called DV mode (digital voice) operation
-- voice is converted to a digital format using electronic chip called a codec which encodes and decodes audio signals.
-- the quality of DStar may sound slightly inferior to high quality FM signals but it's more than adequate for intelligent voice communications
-- when it works right the quality is crystal clear as long as the signal remains above a minimum threshold, without picket fencing or weak signal artifacts
-- if the signal falls below the level required for the coding, communication will drop out or become garbled sounding a bit like the r2d2 Star Wars character
-- it takes a little getting used to Dstar in terms of learning the flow and sound, but well worth it
-- interestingly in DV mode slow speed 1200 digital data can be transmitted at the same time and on the same frequency while you are talking in voice communication
-- since both voice and data are being handled internally they can be transmitted together on the same signal without any interference to your voice conversation

-- While called slow speed 1200 bps DV mode data is more than capable of keeping up with typing on a keyboard for transmitting short messages and small amounts of data

-- connecting your PC laptop or tablet is simply a matter of connecting a cable to the radio

-- using a gateway, numerous computers and repeaters can be connected via the internet using a setup called a gateway

-- gateways are used on the internet to connect other DStar gateways and reflectors anywhere in the world

-- this allows you to communicate with hams located in areas far away from your local repeater

-- it is similar a little bit to IRLP operation, but the D star system can keep track of which repeater you were last heard on

-- by entering the call sign of the person you want to contact in your radio you can make a directed call to a specific ham

-- this technique is referred to as call-sign routing and unlike IRLP you don't need to know which repeater the person is on

-- call-sign routing can be thought of as being similar to how a cell phone operates; as you travel around the cell system knows where you are