

## **EchoLink a System Overview and how to get started.**

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Some time ago I wrote an article on IRLP. The next logical step is to look at Echolink and the addition functions available in this application.

In summary

IRLP –

1. Can link IRLP nodes together.
2. Connect nodes to Conference Bridges (called reflectors)

ECHOLINK -

1. Can link nodes together that are connected to Single Users, Link radios or Repeater radios.
2. Can link a Single User nodes to another Single User node.
3. Connect Echolink nodes to Conference Bridges (called reflectors)

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EchoLink is a computer based Amateur Radio system that allows radio amateurs to communicate with one another using Voice over IP (VoIP) technology on the internet for at least part of the path between them. It was designed by Jonathan Taylor, a radio amateur with callsign K1RFD.

The system allows reliable worldwide connections to be made between radio amateurs, greatly enhancing Amateur Radio's communications capabilities. In essence it is the same as other VoIP applications (such as Skype), but with the unique addition of the ability to link to an amateur radio station's transceiver and is closed to Licenced Amateurs.

You can used Echolink from an normal radio with DTMF into a Echolink node in your area. Although easy to establish there are not many around.

Why is this technology important? It allows amateur to operate from antenna hostile places. That is locations where you can't put up antennas and communication is difficult to talk with your mates. Very important for our older members in retirement homes, Hotels etc.

### **System Overview**

The Echolink system is made up of a number of nodes. These are the points where connection are made over the Internet. Link between nodes are set up to carry voice or audio across the Internet. There are also echolink servers to handle the administration and have information on the status of each node. On-line or Off-line etc. There is not a discussed in any detail paper.

The Internet side of each node is the same for all nodes as it runs on a Windows PC. For the purpose of this paper we will call it the "Network" side of the node.

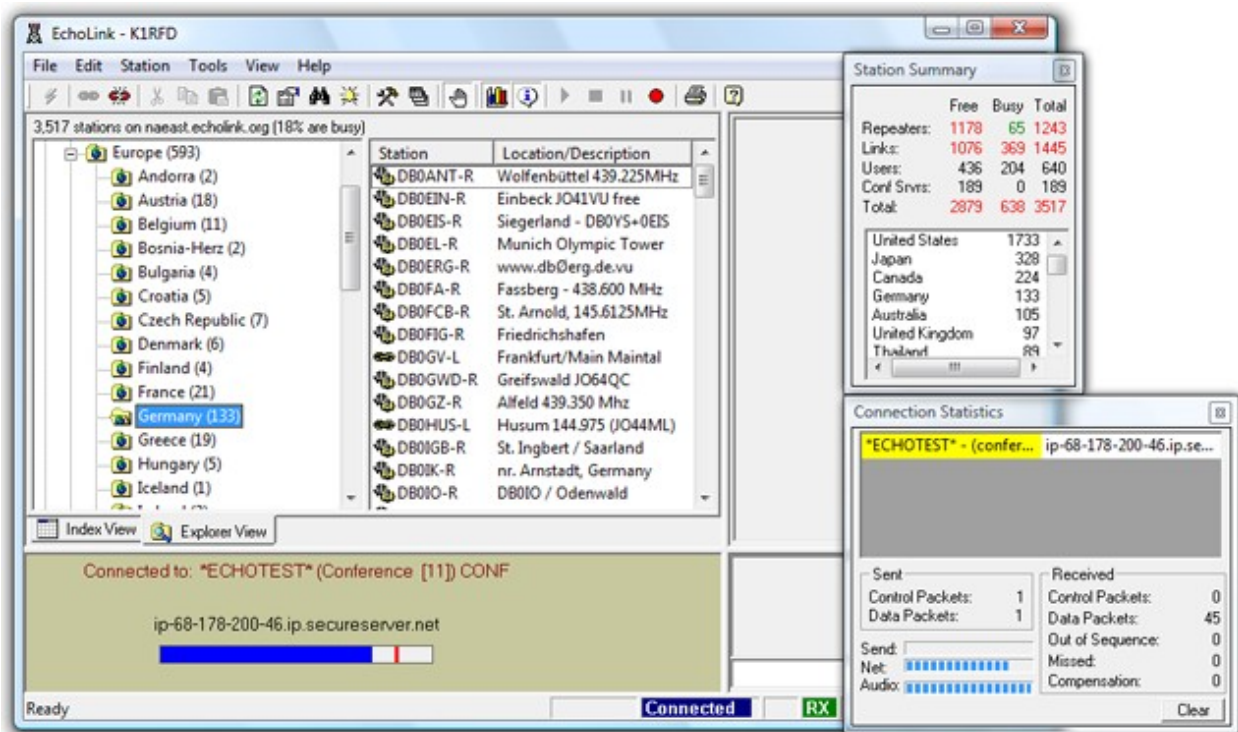
Having described the Network side of the node we now need to look at the User interface side of the node. The Echolink node has 2 types of User interfaces. Single

User, and SysOP. Single User uses the PC Sound Card with microphone and speakers in a simplex mode. Eg PTT. (see diagram node A) After connecting to another node voice or audio is passed between nodes. See Voice over Internet below for more detail.

SysOp mode is where the PC Sound card is connected to a FM transceiver rather than the PC Microphone and speaker. (see diagram node B) When another node connects to a SysOp node the audio is sent and received via the transceiver. Again this is in simplex mode.

### What is required to Setup Echolink.

The minimum hardware to set up a Single User node (node A) is a Windows PC with an Internet connection. After loading Echolink application you must register your call sign with the EchoLink administrator. You can now connect to any other Echolink node and converse with the computer microphone and Speakers. Nodes are selected from the list of on-line nodes in the Echolink programme.



This is a screen view of the echolink application.

You can use a Headset with microphone to enhance the operation.

### SysOp node.

The next stage is a Sysop node where the headset and Microphone are removed from the PC sound card and a radio interface is used to connect a transceiver. There are two Subtypes in SysOp configuration. These are Link and Repeater. (see node B and C) In

the “Link” configuration the Transceiver is used in simplex mode. EchoLink display this node information as VK3IFM-L and appears as such on the screen. In the “Repeater” configuration the Transceiver is set to a repeater frequency in this mode in a repeater service area. EchoLink display this as VK3IFM-R Note – The EchoLink Repeater node is sited within range of the repeater it is accessing.



An example of a PC to transceiver interface. This one plugs into the Computer in a USB socket and the Auxiliary jack on the radio. It is that simple. Well sort of simple. Well simple if you know what you are doing. Powered from the USB port in the PC

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### **Establishing Echolink Connections.**

There are two ways to talk to the node to set up a connection to another node. The first way is as a Single User and this is done from the Single User node PC. As seen the the first picture. Use the mouse to point and click. (see diagram Type of Connections 1-3) The second method is use with the SysOp interface by sending the node number in DTMF. (see diagram Type of Connections 4)

#### **When a Single User node connects to another node.**

(see diagram Type of Connections 1-3) A Single User connects to another EchoLink node by using the EchoLink application. It has a list of nodes that are on-line right now. You simple select one and connect. The connection will be confirmed on screen and you can commence a QSO with the PTT function in echolink application. On completion of the QSO you release the connection or link. Note – You can connect to Single Users nodes , Link radios or Repeater radios nodes.

#### **Connection from a Radio.**

(see diagram Type of Connections 4) From the normal radio DTMF tones are used to establish an Echolink connections. These connections are established from a Link node or Repeater node that you can access in your area. To set up the connection to a distant node we use the EchoLink node numbers. The Echolink node has assigned a 6 digit number by the System administrator. To connect your local Echolink node to a distant node you used the distant node number (not the local node number) Press the PTT and send the 6 digits in DTMF. Connect will be confirmed over the radio. You can then QSO from your radio to the orginating node you are using to the distant node you connected too. To release the connection PTT and send # My EchoLink node

number is 515584

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**Voice over the Internet.** This section deals with the audio passing over the internet and is not required to understand Echolink. **VoIP** Voice or audio is passed between nodes over the internet using a system called VoIP (Voice over Internet Protocol) during the QSO (conversation). The node converts the audio from the transeiver to VoIP .

1. Sample the audio using an A/D converter . (analogy to digital) The A/D converter used by echolink network is the input source of a standard PC sound card (APC). This creates a continuous mono 16-bit digital stream of raw audio at 8000Hz (120000 bps).
2. Compress the audio by down sampling the stream and using an 4-bit ADPCM algorithm Analog to Digital Pulse Code Modulation) to reduce the size of the stream by a factor of four (32000 bps)
3. Split the sample into small chucks (or packets).
4. Transmit the packets to the remote host using a UDP stream (User Datagram Protocol). UDP does NOT confirm the reception of packets, so it uses a "fire and forget" method.
5. Receive the packets on the remote node.
6. Join the split packets back into a 4-bit ADPCM stream.
7. Uncompress the ADPCM stream back into an 16-bit raw stream of audio.
8. Play the raw audio stream through a D/A converter (digital to analogy) being the output device of a computer sound card.

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References –

Echolink User's Guide Contact Ian VK3IFM and I can email you a copy.

Echolink website <http://www.echolink.org/> for software and status of connected users, Links, Repeaters and reflectors. This includes registration.

Wikipedia <http://en.wikipedia.org/wiki/Echolink>

Link Status <http://www.echolink.org/links.jsp> This link gives you the status of nodes that are online or offline at any time. Is also very useful to find the closest node to you location. You will need your grid square reference. Eg QF22OC