

# IRLP: The Internet Radio Linking Project

Has the internet killed ham radio? Not according to Paul Cassel, VE3SY. For him, just the opposite is true. In this article Paul outlines an exciting new mode of communications—linking of ham radio to the internet.

By Paul Cassel,\* VE3SY

You turn on your 2-meter rig after a several-year absence from VHF and hear a QSO between VK3JED and WYØX. You think you have tourists visiting your town until you hear Nate, WYØX, is in Denver, Colorado on his way to work at 7 AM and Tony, VK3JED, is talking about going to bed, as it's past midnight at his QTH. You think you are hearing an HF link, but with quality like that of a local FM station, you ask some questions and find out that you have discovered the growing world of the Internet Radio Linking Project (IRLP).

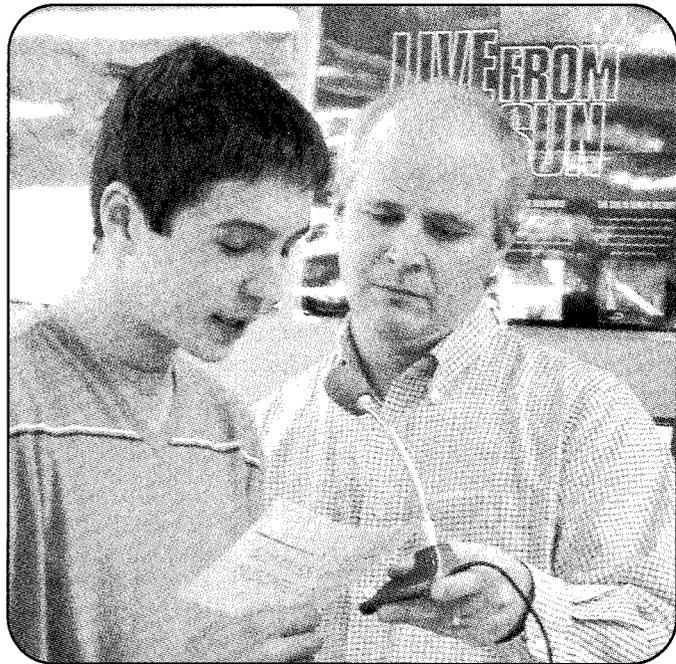
Thanks to this growth and the availability of high-speed internet connections, we have a new and powerful tool for secure, reliable repeater linking. By enabling our FM repeaters and selected simplex channels with IRLP, we can provide instant on-demand-linking worldwide with one or more repeaters. If you're concerned about cost, this entire project definitely fits into a "ham approved" budget of under \$125, including the IRLP hardware and software.

The Internet Radio Linking Project is an exciting new technology that is rapidly becoming the standard for Voice Over IP (VoIP) repeater linking, bringing many users back to ham radio on our VHF/UHF and SHF bands. Thanks to IRLP worldwide repeater linking, this new technology is also becoming a tremendous catalyst for bringing new, young blood into our hobby. Now hams with a simple HT or mobile setup can enjoy worldwide coverage with excellent audio quality as they talk with their friends across the country and around the world.

Many dedicated HFers claim that IRLP is not real radio. Others claim this is the breakthrough that will be looked back on as the technology that revitalized the interest of teenagers in ham radio.

A recent pass of the International Space Station over Chapel Hill, North Carolina and its scheduled QSO with the Phillips Middle School was transmitted via IRLP to 38 repeaters around the world, including two in Australia, where a group of VKs got up to listen at 3 AM their time. Just prior to the school QSO, it was very exciting to hear a brand new 9-year-old ham make her first QSO after having received her license that morning. I'm sure this will remain forever fixed in her mind after talking from her father's car in south Texas to a ham in Canada.

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*Aliosha Silvra, KG4FTR, speaking with the International Space Station from Chapel Hill, North Carolina on November 9, 2001. The contact was relayed worldwide via IRLP.*

Then there is the daily pile-up for a rare DX contact with KC4ACV in McMurdo Station, Antarctica. More on this topic will be covered later.

## How is This Happening?

This question is heard daily as new nodes come online and local repeater users are not aware of what they are hearing. When they are briefed and receive the URL for IRLP <<http://www.irlp.net>>, they find that IRLP is the brainchild of Dave Cameron, VE7LTD, of Vancouver, British Columbia, Canada.

In 1998 Dave was experimenting with various Voice Over IP amateur applications but became frustrated with the unreliable operation of Windows®-based VoIP applications. At that time, all Windows®-based linking software used VOX and

allowed non-amateurs easy access to amateur radio frequencies via a PC headset or microphone.

Eight months after Dave started his design work, he created the IRLP network on a Linux platform; it is now on Version 2 of his hardware and software. The network slowly started growing around British Columbia and Canada's east coast and then continued into the US, Australia, the UK, and the Caribbean. As this issue of *CQ VHF* hits the streets, IRLP will be approaching 400 active nodes worldwide, and it continues to grow by leaps and bounds.

## Using the IRLP Network

To connect to another repeater or reflector (we call them *nodes*) you simply dial a DTMF on-code.<sup>1</sup> Within a few seconds after the authentication PGP keys have been exchanged, the called node will identify its callsign and location in plain voice. If the node is currently engaged in another connection, you will receive a voice message telling you to which station the other repeater is connected. If the other node has enabled call waiting, they will hear a very brief message when the local PTT drops reporting which node attempted a call.

Before placing a call, you can check the status of any node in real time at <<http://status.irlp.net>>. This page updates in close to real-time, so it is always current and auto refreshes every five minutes.

Just as with any linking system, IRLP is subject to some minor delays, which mostly are tone-squelch related. (To dispel internet delay myths, the audio delay over the internet is about the same as you experience when using a digital cell phone).

When finished with a QSO, announce your callsign and dial the OFF code. A voice message indicating the link is dropping will play. There are always a number of nodes left connected to the Denver CO Reflector, allowing you to place a CQ or QRZ-type call with an excellent chance of speaking with someone somewhere in the world.

## New Excitement in the Air

The most satisfying aspect of listening on IRLP is hearing the excitement in the

*\*Technicians may use repeaters with HF links as long as the frequency on which they are transmitting is above 50 MHz. The control operator of the linked repeater must have HF privileges and the Tech becomes a third party.—ed.*

voices of people both young and old who had become bored with conventional FM repeater operation. Probably the phrase most often heard on IRLP is "Where did you say you were located" or "How is this happening?" When you hear these questions, you know you have a first-time user on IRLP and a chance to pass the word. For the newbies, as the story and excellent audio quality unfold to them, you can hear the excitement grow in their voices. Very satisfying indeed!

It is not unusual for first-time users with Technician licenses to often hold off replying to a distant station, believing they are tied into a repeater with an HF link not covered by their license.\* When told what is happening, the excitement in their voices provides great reward for the efforts of IRLP proponents.

## Last Two Please—Not!

Who would ever believe the need to take a list to work DX in Antarctica on 2 meters? Recently there was such a pile-up on various repeaters around North America, and this author took over the task of (God forbid and forgive me) "List Manager" to handle the calls from hams across the US and Canada. This is the exception rather than the rule, but many hams who have been on HF for years have been making their first contact with Antarctica via IRLP rather than on HF.

## The McMurdo Station Antarctica Node

The continent of Antarctica became QRV October 23, 2001, and in the first

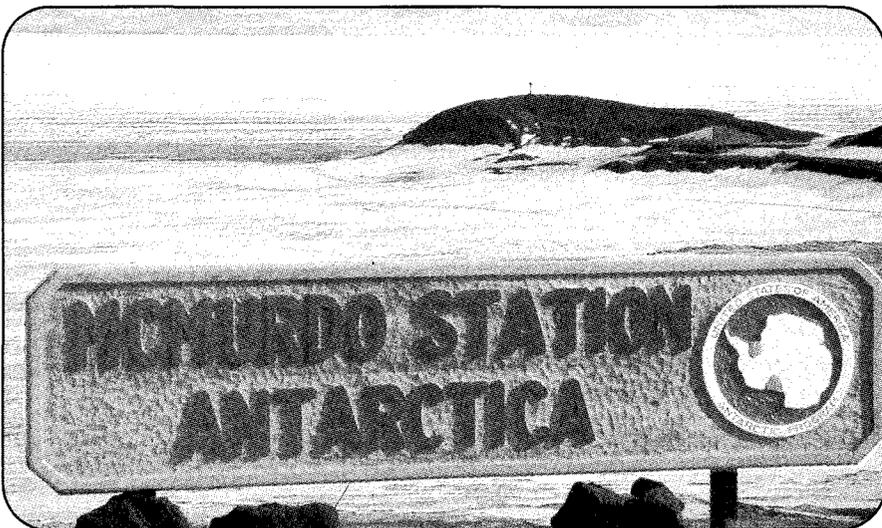
two weeks logged over 1000 contacts with VHF/UHF operators around the world. Chuck Kimball, NØNHJ, built the node at McMurdo Station using a Motorola GM300 Mobile Radio on 146.520 carrier squelch, on a simple 1/4-wave antenna. Chuck said via e-mail that the setup covers most of the town area quite well, even though it's more than a mile across town.

Chuck went on to say, "Our internet is a part of a T1 that connects us back to the United States via an Intelsat Satellite. The T1 provides all of our phone service, several dedicated data circuits, and about 650K of bandwidth for the internet. It's used for moving science data from many research projects back to the States.

"We are on the south side of a volcano and cannot see the northern horizon, so we have a remote ground station on another island about 20 miles away. Our connection travels via microwave to Black Island (the ground station—the satellite is only 3 degrees above the horizon). It travels via the satellite to a ground station in Washington State. It then is connected via a fiber network to a NASA facility, where we are interconnected with the internet."

Chuck had seen some references to internet linking for ham radio a couple of years ago, but he hadn't gotten very far in researching it. Last year at McMurdo, Chuck found out that Dave Cameron had come out with Version 2 IRLP boards and had them available, so he ordered two before leaving "the ice" in late January 2001.

When asked how often they get to activate the IRLP node, Chuck said, "There are only about four hams active on 2



McMurdo Station town-limit sign. (Photo by NØNHJ)



Chuck, NØNHJ, beside a VHF repeater antenna and solar panels used at McMurdo Station, Antarctica. (Photo by NØNHJ)

meters, so there are a lot of unanswered calls. Most of us work six days a week, nine hours a day, so there is not a lot of free time for ham radio operation.”

## IRLP Reflectors

In this article we have been referring to reflectors. A reflector is a Linux server that allows multiple nodes (repeaters) to be linked together at the same time. As of press time, there were nine reflectors. They are located in Toronto, Ontario; Saskatoon, Saskatchewan; Vancouver, British Columbia; Fredericton, New Brunswick; Denver, Colorado; Raleigh, North Carolina; Las Vegas, Nevada; Yellowknife, Northwest Territories (Canadian Arctic); and Sydney, New South Wales, Australia. Most reflectors are hosted by public-service-minded companies that offer extreme broadband

facilities to support the requirements of corporate accounts, and of course are more than adequate to host a reflector.

The bandwidth requirement for a reflector is directly related to the number of simultaneously connected nodes. During a recent International Space Station pass and QSO with Barbara Pedersen, KE4JZM’s science class at Phillips Middle School in Chapel Hill, North Carolina, with 40 nodes connected, the bandwidth being used on the Raleigh reflector was just shy of two megabytes.

The reflector most used worldwide is in Denver, Colorado. Also known as Reflector 2, it always has a number of US, Canadian, Australian, and Caribbean repeaters connected, so any conversation that occurs on one repeater is heard on all connected stations.

CANWARN<sup>2</sup> net controllers in southern Ontario are linking themselves via

IRLP using the new Ontario Reflector hosted by Group Telecom in their Toronto Central Office. This allows the CANWARN controllers to rapidly exchange severe weather information between themselves and the Environment Canada Toronto Severe Weather Desk without interfering with the local CANWARN nets. The east coast reflector, located in Raleigh, North Carolina, is designed to handle east coast repeater linking during the hurricane season.

## Listening from Your PC

This author provides a live stream of the audio being transmitted by Reflector 2. Because this Denver reflector has the most activity, you can get a good idea of how the audio sounds and how the network works relative to your local repeater. You will be surprised how clean the network is, with no courtesy tones, drop out tails, or CW IDs. All of these annoying extraneous items are suppressed on the IRLP network, so all you hear is user audio and your LOCAL ID and courtesy tone.

To listen, point your browser to <http://www.kwarc.org/listen/> for details and a direct link to the Live365 server which handles the streaming.

## Active Nodes Around the World

The “Locations Active on IRLP” box with this article shows places around the world that are active on IRLP as of this writing, sorted by callsign. As for DX stations, you can look for KC4USV in McMurdo Station Antarctica and two dozen repeaters in the “land down under” (Australia and New Zealand). When working these stations, it reminds you of the movie *Back To The Future*, as most QSOs with VK/ZL land are taking place tomorrow.

There are numerous nodes in England, as well as in Trinidad and The Commonwealth of Dominica (not the Dominican Republic), where it is not unusual to hear Bernadine, the mayor of the capital city Roseau, on the air promoting the “Nature Island. You also may hear J79 stations from neighboring St. Lucia accessing the Roseau repeater across the Caribbean.

There are numerous nodes throughout the Hawaiian Islands, Alaska, and the Canadian Arctic as well. New nodes are now on the air from Scotland, Sweden,

## Locations Active on IRLP

Call sign	City	Prov./St.	Call sign	City	Prov./St.	Call sign	City	Prov./St.
9Y4AT	Valsayn	Trinidad	KE4EUE	Chesterfield	VA	REF930	Saskatoon Reflec.	SK
9Y4SRR	San Fernando	Trinidad	KE6DGM	Norwalk	CA	REF931	Fredericton	NB
9Z4CG	San Fernando	Trinidad	KE6PCV	Los Angeles	CA	SARA	Province Wide	AB
AB7TJ	Minden	NV	KE6WUK	Sunset Ridge/LA	CA	SK6RAB	Oxaback	SW
AC4RZ	Easley	SC	KF3DY	Wellsboro	PA	VA2RLP	Baie-Comeau	QC
AC7DE	Helena	MT	KF6FM	Riverside	CA	VA3BBB	Windsor	ON
AE4GB	New Port Richey	FL	KF6JEE	Woodcrest	CA	VA3BJD	Oakville	ON
AF4TZ	Nashville	TN	KF6SWL	Omaha	NE	VA3CTR	Markham	ON
AH6CP	Honolulu	HI	KG4OKL	Huntsville	AL	VA3EWC	Barrie	ON
AH6GR	Maui	HI	KG4QAC	Tampa	FL	VA3LU	Thunder Bay	ON
AH6JA	Hilo	HI	KG6EAO	Kapaa	HI	VA3MME	Omemee	ON
AH6LE	Mt. Angel	OR	KG6EVO	Tahoe City	CA	VA3RVU	Brampton	ON
AI7J	Ogden	UT	KH2BI	Pasadena	CA	VA3SCR	Innisfil	ON
GØFUO	Mexborough	SY	KH6FV	Honolulu	HI	VA3SCR	Innisfil	ON
GØXEL	Manchester	—	KH6GMP	Kailua Kona	HI	VA3SCR	Innisfil	ON
G4BVV	Maltby	SY	KH7R	Henderson	NV	VA6IRL	Lethbridge	AB
G4CUI	Sheffield	SY	KL3K	Anchorage	AK	VA7HAM	Penticton	BC
G4EID	Southport	MER	KU6V	Fremont	CA	VA7LPG	Nanose Bay	BC
G4NJI	Rotherham	SY	M1ERS	Sheffield	SY	VA7MAR	Mackenzie	BC
G8UVE	Burnley	LA	MM1BHO	Castle Douglas	Scotland	VA7OKN	Vernon	BC
GB3LV	London	UK	NØPSR	Denver	CO	VA7RDX	Vanderhoof	BC
GB3US	Sheffield	SY	NØSZ	Boulder	CO	VE1BAS	Orleans	ON
J73CS	Roseau	Dominica	N1HU1	Branford	CT	VE1CRA	Charlottetown	PEI
J73D	Roseau	Dominica	N2BJ	New Lenox	IL	VE1II	Truro	NS
K0PCG	Des Moines	IA	N2CKH	Lakewood	NJ	VE1KK	New Glasgow	NS
K1DF	Albany	NY	N2LKV	Stony Point	NY	VE1NSG	Halifax	NS
K1IMD	Long Island	NY	N2MH	West Orange	NJ	VE1WN	Greenwood	NS
K1IMD	Riverhead	NY	N3APP	Erie	PA	VE1WRC	Amherst	NS
K3TAT	Media	PA	N3IO	Malvern	PA	VE1WY	Lindsay	ON
K4KSA	Tampa Bay	FL	N3IO	Philadelphia	PA	VE2BRR	Montreal	QC
K6IOK	Auburn	CA	N3RJC	Lansdowne	PA	VE2CRA	Ottawa	ON
K6IXA	Atwater	CA	N4GLB	Upstate	SC	VE2REA	Quebec City	QC
K6JSI	San Diego	CA	N4HAJ	Kinston	NC	VE2RJS	Montreal	QC
K6JSI	San Diego	CA	N4IRS	Stuart	FL	VE2TPE	Baie-Comeau	QC
K6JXY	San Marcos	CA	N4MSE	Dallas	TX	VE3ADT	Milton	ON
K6KCP	Sacramento	CA	N4NEQ	Atlanta	GA	VE3BIP	Belleville	ON
K6RTL	Sacramento	CA	N4PJR	Jesup	GA	VE3DJD	Burlington	ON
K6UB	Saratoga	CA	N4XQM	Atlanta	GA	VE3DPL	Norwich /Delhi	ON
K7SDC	Castle Dale	UT	N5CWH	Gilbert	SC	VE3EI	Cornwall	ON
K9DRF	Peoria	IL	N5IUF	Dallas/Ft. Worth	TX	VE3IRL	Toronto	ON
K9IP	Indianapolis	IN	N5LEZ	Electra	TX	VE3KBR	Kingston	ON
K9WZ	Plymouth	IN	N6ICW	Sacramento	CA	VE3KD	Sault Ste. Marie	ON
KA1UAG	West Lebanon	NH	N6JVH	Los Angeles	CA	VE3KNA	Franktown	ON
KA2JZO	Bordentown	NJ	N6JVH	North Hills	CA	VE3KR	Nobleton	ON
KA3KCJ	Downingtown	PA	N6KNW	Santa Clarita	CA	VE3MOT	Toronto	ON
KA3VMA	Drexel Hill	PA	N6SEX	N/A	CA	VE3MUS	Huntsville	ON
KA6UAI	Palomar Mtn	CA	N6SEX	Sacramento	CA	VE3NUU	Monkland	ON
KA7STK	St. George	UT	N7BFS	Spokane	WA	VE3OAK	Oakville	ON
KB2FAF	Cortland	NY	N7CK	San Manuel	AZ	VE3ORX	Orangeville	ON
KB3HF	St. Peters	MO	N7GZT	Columbia	SC	VE3OVQ	Guelph	ON
KB5DBR	Ponca City	OK	N7HQZ	Ferdale	CA	VE3PGC	Cornwall	ON
KB6JAG	Hemet	CA	N7LZM	Kennewick	WA	VE3PNO	Toronto	ON
KB6THO	Pasadena	CA	N8BC	Painesville	OH	VE3RAK	Toronto	ON
KB7LVC	Boise	ID	N8DNX	Stutsmanville	MI	VE3RBM	Kitchener	ON
KB7RSI	Las Vegas	NV	N8HEE	Charlotte	MI	VE3RPT	Toronto	ON
KB8JXX	Anchorage	AK	N8OJ	Marietta	OH	VE3RWN	Bethany	ON
KCØMDI	Rolla	MO	N9CZV	Show Low	AZ	VE3SEX	Almonte	ON
KC4IBT	Vero Beach	FL	N9EP	Barrington	IL	VE3SUE	London	ON
KC4USV	McMurdo Station	—	N9GPY	Culver	IN	VE3SY	Petersburg	ON
KC7BSA	Fruitland	ID	N9OIG	Union Grove	WI	VE3TST	Stittsville	ON
KC7GHT	Phoenix	AZ	N9TSW	Des Plaines	IL	VE3ULR	Toronto	ON
KC7ZWG	Seattle-Tacoma	WA	N9UWE	Danville	IL	VE3WFM	Waterloo	ON
KC8NCE	Grand Haven	MI	NE1H	Atlanta	GA	VE3XTX	Owen Sound	ON
KD4BBM	Miami	FL	NH6HF	Lihue	HI	VE3YYS	Ottawa	ON
KD4RAA	Raleigh	NC	NJ2FM	Hopatcong	NJ	VE4FFR	Flin Flon	MB
KD4RAA	Raleigh	NC	NV7RM	Reno	NV	VE4SRR	Swan River	MB
KD4Z	Orlando	FL	REF1	Toronto Reflector	ON	VE4UMR	Winnipeg	MB
KD6GDB	Santa Monica	CA	REF2	Denver Reflector	CO	VE5CC	Saskatoon	SK
KD6LVP	Beaverton	OR	REF4	Yellowknife	NWT	VE5CMR	Saskatoon	SK
KD6YYJ	San Jose	CA	REF5	Sydney	NSW	VE5IOU	Prince Albert	SK
KD7BCS	Medford	OR	REF900	Vancouver	BC	VE5MLR	Meadow Lake	SK
KD7EFG	Murray	UT	REF921	Raleigh	NC	VE5RAD	North Battleford	SK
			REF925	Las Vegas	NV	VE5SCR	Swift Current	SK

VE5SKN	Saskatoon	SK
VE5WM	Regina	SK
VE6COM	Lethbridge	AB
VE6KJM	Airdrie	AB
VE6LGL	Grande Prairie	AB
VE6LH	Calgary	AB
VE6LT	Red Deer	AB
VE6MHU	Medicine Hat	AB
VE6MPR	Banff	AB
VE6PRR	Peace River	AB
VE6RGP	San Diego	CA
VE6RJZ	Canmore	AB
VE6RPT	Calgary	AB
VE6SBR	Edmonton	AB
VE6TE	Red Deer	AB
VE6TOT	Canmore	AB
VE6TRC	Ft. McMurray	AB
VE6WRT	Calgary	AB
VE6XZ	Calgary	AB
VE6ZV	Calgary	AB
VE7BHI	Port Alberni	BC
VE7CAP	Cranbrook	BC
VE7DQC	Prince Rupert	BC
VE7FFF	Prince George	BC
VE7KU	Port Alberni	BC
VE7MFS	Coquitlam	BC
VE7PQD	Parksville	BC
VE7RAM	Tappen	BC
VE7RAP	Comox	BC
VE7REE	Penticton	BC
VE7RGF	Grand Forks	BC
VE7RHS	Vancouver	BC
VE7RIA	Victoria	BC
VE7RJZ	Invermere	BC
VE7RMR	Maple Ridge	BC
VE7RMT	Victoria	BC
VE7RNA	Chemainus	BC
VE7RTS	Kamloops	BC
VE7RVN	Vernon	BC
VE7TSI	Kamloops	BC
VE7UHF	Richmond	BC
VE7URG	Vancouver	BC
VE7VIC	Victoria	BC
VE8NWT	Yellowknife	NWT
VE8YK	Yellowknife	NWT
VE9ACP	Fredericton	NB
VE9ARZ	Fredericton	NB
VK1RBM	Canberra	ACT
VK2RAG	Gosford	NSW
VK2RBM	Sydney	NSW
VK2RCZ	Sydney	NSW
VK2RIC	Lismore	NSW
VK2RMP	Wollongong	NSW
VK2RMR	Mt. Riverview	NSW
VK2RTZ	Newcastle	NSW
VK2TTA	Wahroonga	NSW
VK2WAG	Wagga Wagga	NSW
VK3HEG	Ballarat	VIC
VK3JED	IRLP-Experimental	VIC
VK3RGL	Melbourne	VIC
VK3RMH	Melbourne	VIC
VK3RPU	Arthur's Seat	VIC
VK3WRM	Merbein	VIC
VK4BAB	Ipswich	QLD
VK4RCA	Cairns	QLD
VK5UJ	Adelaide	SA
VK6AMS	Karratha	W.A.
VK6RAL	Albany	W.A.
VK6RFM	Fremantle	W.A.
VK6RNC	Perth	W.A.
VK6XAA	Collie	W.A.
VK7AX	Ulverstone	TAS
VK7DY	Tea Tree	TS
VK8RTE	Darwin	NT

VO1AAA	New Harbour	NF
VO1BWP	Corner Brook	NF
VO1HHR	Grand Falls	NF
VO1KEN	St. Johns	NF
VY1RHJ	Haines Junction	YT
VY1RW	Whitehorse	YT
W0GFQ	Palm Springs	CA
W0KU	Golden	CO
W1CDO	Seattle	WA
W1ET	Hanover	NH
W1MD	Portland	ME
W1QWT	Scituate	MA
W2CNY	Syracuse	NY
W2ISB	Liverpool	NY
W4DOC	Atlanta	GA
W4RPT	Nashville	TN
W4VM	Huntsville	AL
W6DXX	Palm Springs	CA
W7AOR	Las Vegas	NV
W7AOR	Las Vegas	NV
W7DFD	Tucson	AZ
W8HDU	Lima	OH
W8JL	Marietta	OH
W9ADS	Champaign	IL
W9BCU	Wausau	WI
W9CEQ	Aurora	IL
W9DXN	Dixon	IL
W9SH	Fishers	IN
WA1NVC	Framingham	MA
WA2ZPX	Middletown	NY
WA3ADI	Havertown	PA
WA3KOK	Washington	DC
WA3UMY	Lexington Park	MD
WA4HND	Grand Junction	CO
WA6JFK	Los Angeles	CA
WA6LA	Palos Verdes	CA
WA6LA	Palos Verdes	CA
WA6LCN	Marinwood	CA
WA6RQD	Oceanside	CA
WA6RQD	Oceanside	CA
WA6SUP	Sacramento	CA
WA6TMJ	Hanover Park	IL
WA6TWF	Santiago Peak	CA
WA6VPL	Lompoc	CA
WA6WDC	Sun Valley	AZ
WA7SPY	Sacramento	CA
WB2BQW	New Windsor	NY
WB2HWW	Queens	NY
WB2NBU	Palm Beach Gar.	FL
WB2WPA	Naples	FL
WB3EHB	Camden	NJ
WB4IVB	Corbin	KY
WB5EKU	Los Angeles	CA
WB5TUF	Houston	TX
WB6ARE	Cedar Park	TX
WB6EGR	Burbank	CA
WB6EGR	Santa Clarita	CA
WB6HII	Eureka	CA
WB7RES	Caldwell	ID
WB8CXO	Akron	OH
WB8NXP	Southfield	MI
WD6AWP	Huntington Beach	CA
WD8CIK	Hollywood	CA
WJ2W	Terre Haute	IN
WR2ROC	Rochester	NY
WR6AVM	Honolulu	HI
WR6HMB	Half Moon Bay	CA
WR6JPL	Pasadena	CA
WX7Y	Castle Dale	UT
WY0X	Centennial	CO
ZL2LD	Masterton	NZ
ZL2WKI	Palmerston North	NZ
ZL3TMB	Christchurch	NZ

Japan, Ecuador, and the Netherlands, and other countries around the world will soon join the IRLP family.

## A Look Under the Hood

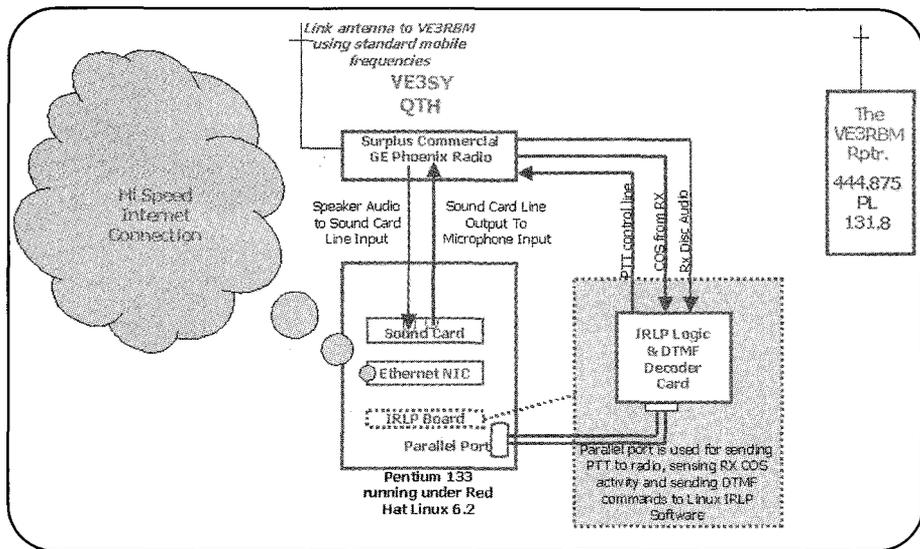
An IRLP node can be interfaced either directly with a repeater or via a link radio, in which case the IRLP hardware/software takes the audio from the receiver and feeds it into the Line-In of the sound card, where it is converted into ADPCM<sup>3</sup> digital data. The Linux PC then converts this digital information into packets assigned IP addresses for the destination node.

These packets flow through the internet to the destination Linux PC, where the packets are decoded. The signal is then sent from the sound card's Line-Out to the transmitter microphone audio circuit of the link radio, which then transmits the audio over the local repeater. The transmitter is keyed as soon as these TCP/IP (Internet Protocol) packets start to arrive. As soon as the data stops, the link radio un-keys and the process reverses.

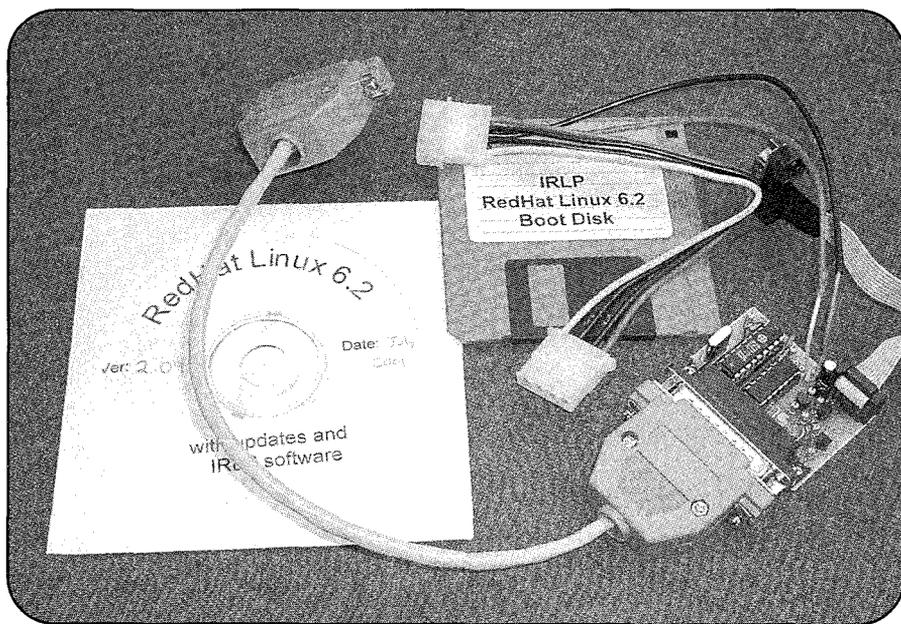
Each connection request with another node or reflector is challenged for a PGP encryption key to validate that the originating node is a valid station. This very secure method of real-time validation assures only licensed nodes are able to connect with another node or reflector.

The underlying audio processing technology in IRLP is a freeware application called "Speak Freely." Speak Freely produces VoIP audio streaming and is very similar to other VoIP software packages such as Microsoft NetMeeting, VocalTec iPhone, and the M0CSH iLINK, with one major difference: It runs under Linux, not Windows®; unlike iPhone and iLink, no access is possible from a PC. To avoid third-party issues in some countries, *all IRLP communications are by design radio-to-radio with no access possible from a PC.*

Linux was Dave's operating system of choice for the IRLP system, as it allows the best in reliability, programmability, efficiency, and functionality. Because our repeaters don't need anything even close to MP3 audio quality, IRLP is using a low-bitrate VoIP to communicate. Most nodes use an encoding system that requires only 32 KB/s of bandwidth; however, some nodes with extremely limited bandwidth use a GSM encoding method that only requires 10 KB/s, albeit at the cost of some audio quality. A full-time internet connection with DSL, cable modem, or ISDN is required for such a connection.



Most IRLP nodes are located remotely from the repeater to allow access to residential rates for DSL or cable modems. To link the IRLP node audio to a repeater, a link radio is normally used. Here in Canada we are able to link in-band. However, local regulatory restrictions may apply in other countries.



The IRLP hardware and software.

The control of the radio is performed using a small custom logic board, designed by VE7LTD, connected to the computer's parallel port. This board samples the received audio for Touch Tone audio, detects when the link receiver is active, and feeds the TX PTT line to the link radio. All of the command I/O between the PC and the IRLP board is handled by a connection to the PC's parallel port. IRLP is the only VoIP system that provides instant and positive COS and

PTT signals to the network. No VOX is used in IRLP.

The whole system is DTMF (touch-tone) controllable. The control codes lie embedded in a separate program that reads the DTMF tones from the decoder located on the interface controller board and activates various parts of the software. DTMF codes are used to enable/disable linking, open/close links, and set identifiers. Every site has the ability to customize its connection codes and con-

nect directly to any other site(s), either using direct connections or reflector sites.<sup>4</sup>

## Don't Be Afraid of Linux

As you read this, you may say, "But I know nothing about Linux!" Well, speaking first hand, don't worry at all about understanding Linux as a prerequisite to establishing an IRLP node. When I decided to build our first node here in Kitchener-Waterloo, Ontario, I did not even know how to spell Linux. However, because I had most of the bits and pieces and a high-speed T1 connection, I went ahead anyway and ordered the hardware and software.

The software can be installed from a bootable floppy or from the bootable CD; both are provided. The easy-to-follow, step-by-step instructions are in very plain English, making it a breeze to get your machine up and running. As soon as you can establish a link to the internet, you send off an e-mail to the install team indicating you are ready for the IRLP installation. One of several installers around the world will open a secure telnet session with your Linux box and configure the node and install the 512-bit PGP authentication key. If you leave your PC speakers connected, you normally will hear a node connect. In my case it was Pete, VK2YX, in Australia, who provisioned my node, so I heard his local node connect greeting and we were QRV on IRLP.

Incorporated into the IRLP service are regular updates of new host files, as well as IRLP software enhancements and updates. These all occur automatically as part of the daily housekeeping when all of the nodes call home looking for updated files. It is not unusual for uptime of an IRLP node computer to be measured in years rather than hours or days with some Windows® configured machines.

Red Hat security updates are assured as part of the automated weekly maintenance, which includes checking for new updates for your version of Red Hat.

## Minimum Requirements

To host an IRLP node you will need a full-time, high-speed internet connection (DSL or cable works well); a dedicated Linux computer (a 486 DX100 or better); 32 meg of RAM; a 1 gigabyte hard drive; the IRLP custom software/hardware; and a link radio or direct connection to a repeater.

Each node on the IRLP network is as-

signed an ID code, and a central DNS name server keeps track of the IP addresses<sup>5</sup> in use by all nodes. Don't be concerned about robbing bandwidth from your home use, as the IRLP requirement is less than 40k bits, just slightly above the capability of a V.90 dial-up modem.

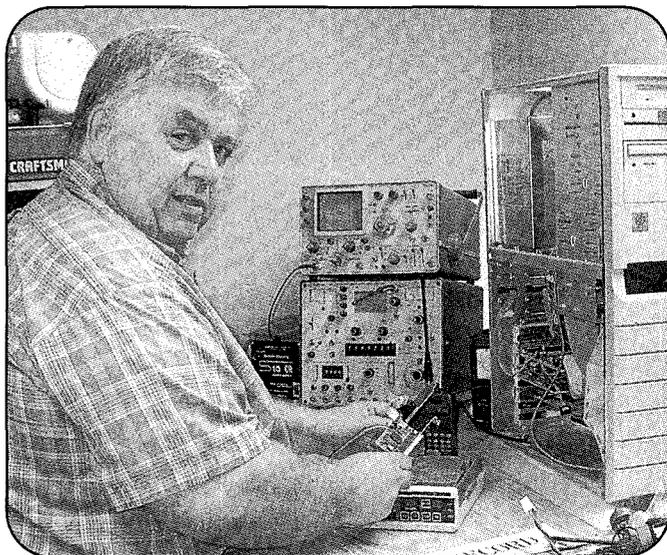
## Summary

This exciting new technology has already begun to prove itself as a tremendous catalyst to bring young new hams into our hobby. Where else can you witness an open, worldwide VoIP wireless network using a free and open protocol such as IRLP?

As we all know, it has been a real challenge for us to draw kids into our hobby, as they can talk 24/7 on iPhone or iLink connections over the internet. Now, compared to other alternatives, they can enjoy far superior reliability and audio quality and be talking around the world from their HTs as they walk down the street.

There is not a day that goes by when you will not hear a new 12- to 16-year-old having the time of his/her life working DX on an HT. The excitement in their voices speaks volumes for what this technology will do for amateur radio. What a great tool IRLP can be to enhance our success in bring young kids into ham radio.

Since our club in Kitchener, Ontario brought our node on line, our membership has been given a real boost. Many former members see the excitement coming back into the hobby, and many new members are joining to be part of the IRLP system. The VE3RBM repeater has gone from possibly two QSOs per week to our busiest repeater and is now dedicated to IRLP use.



*The author interfacing an IRLP board to a radio and PC.  
(Photo by VE3RE)*

However, don't get your HF equipment packaged up ready to list on e-Bay just yet. IRLP is just another tool to enhance our hobby, much like FM repeaters brought many new hams into the hobby back in the 1960s. This author is a very active HF operator but still loves the mobile and HT DX activity now possible via IRLP.

I would like to personally thank the IRLP designer, Dave Cameron, VE7LTD, for his assistance in preparing this article and for his dedication to this wonderful project. I would also like to thank Jim Price, WW4M, for his valuable grammatical assistance in proofreading the article.

In my humble opinion, IRLP is still *Real Radio!*

If this article has piqued your interest and you seek additional information, please browse the official IRLP website at <http://www.irlp.net>. Also, feel free to contact the IRLP designer, Dave, VE7LTD, at [dcameron@irlp.net](mailto:dcameron@irlp.net) or the author at [paul@ve3sy.com](mailto:paul@ve3sy.com).

## References

- <http://www.irlp.net> – Internet Radio Linking Project website
- <http://www.kwarc.org/listen/> – Information on IRLP streaming audio feed
- <http://www.speakfreely.org/> – The VoIP SpeakFreely website
- <http://www.kwarc.org/irlp/> – IRLP user guidelines

## Footnotes

1. Since default node codes are public in some areas, other areas also require a pre-access code.
2. CANWARN is similar to the US SkyWarn system.
3. ADPCM is the same digital protocol used by the phone companies for long-distance service.
4. A reflector is a Linux-based PC sitting on some serious bandwidth which allows multiple audio streams to multiple repeaters.
5. IP is the TCP/IP packet address routing code used by all packets of data flowing on the internet. ■

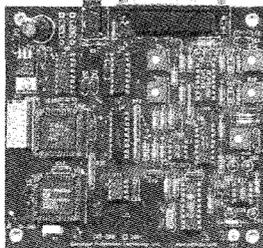
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