# How to connect an IRLP node

146.46 MHz Simplex
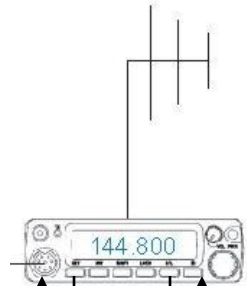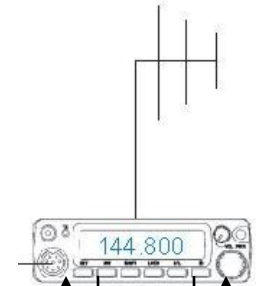
147.58 MHz Simplex

**Simply key up on the node frequency and dial the 4-digit node number**

**To Disconnect dial 73**

144.800

144.800

Parallel Printer Port for PTT & COS

Sound Card Mic & Speaker

Parallel Printer Port for PTT & COS

Sound Card Mic & Speaker

**Internet**

**Craig Davidson**                    **K1BDX**                    K1bdx@amsat.org

# How does an IRLP node talk to another node?

Ispeaker and Imike are software programs that come (for free) with the standard IRLP Linux operating system

**Imike** takes your voice from the mic input on the sound card and digitizes it into UDP voice packets and sends them out over the internet to any IP address and port number that you choose whenever pin 11 on the parallel printer port is shorted to ground
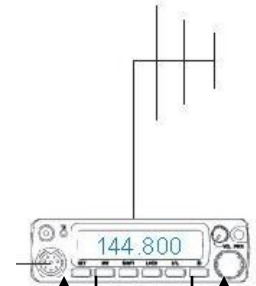
**Ispeaker** listens for UDP voice packets from the internet on any port you choose and turns them back into analog and puts that audio out the speaker jack on the sound card. When valid UDP packets are received pin 3 on the parallel printer port goes high

146.46 MHz Simplex
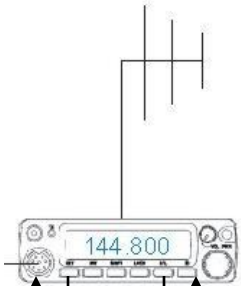
144.800

Parallel Printer Port for PTT & COS

Audio Card Mic & Speaker

147.58 MHz Simplex

144.800

Parallel Printer Port for PTT & COS
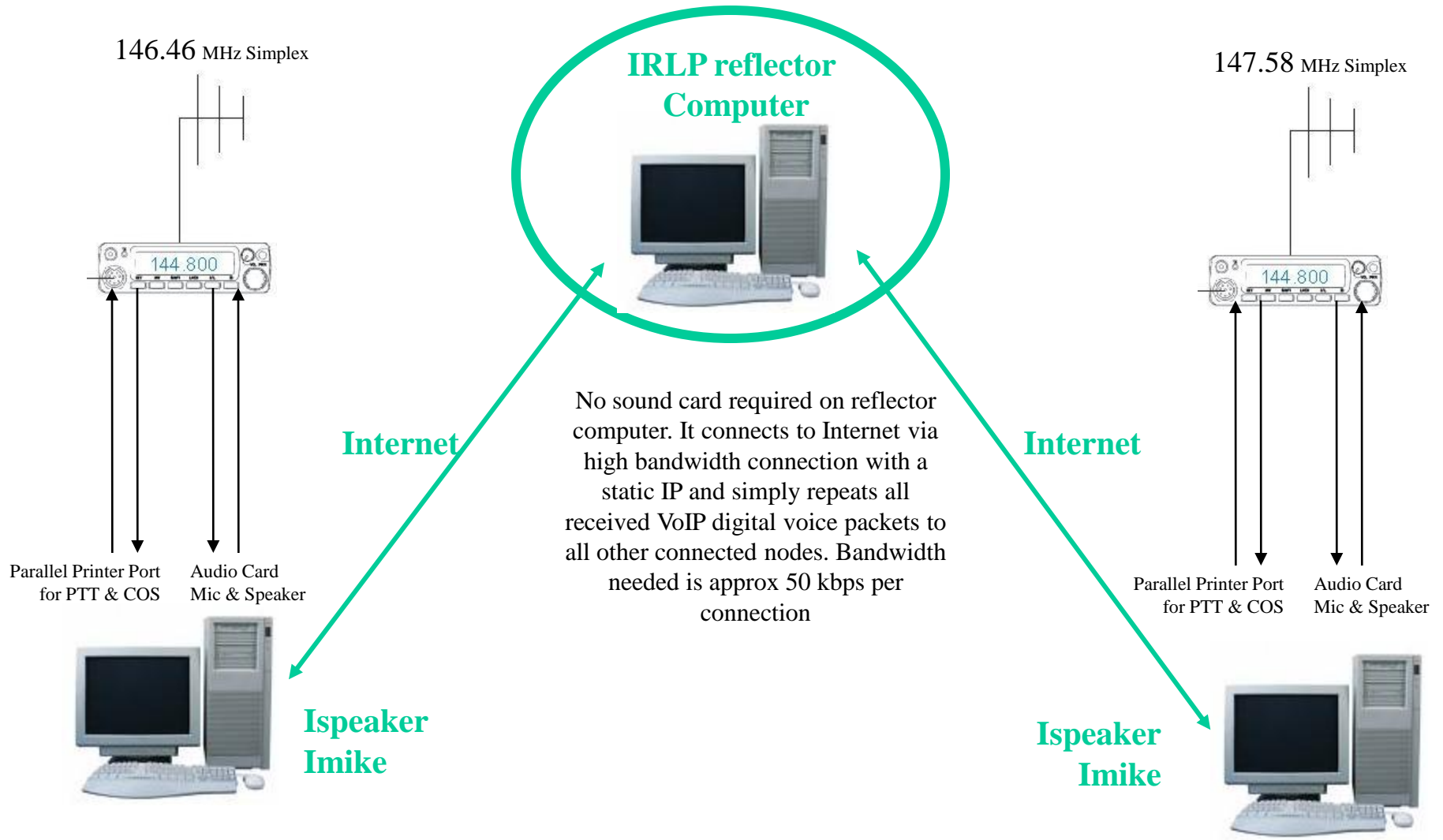
Audio Card Mic & Speaker

## Internet

Imike → Ispeaker

**UDP voice packets**

Ispeaker ← Imike

**Craig Davidson**          **K1BDX**          K1bdx@amsat.org

# How does an IRLP reflector work?

146.46 MHz Simplex

144.800

**IRLP reflector Computer**

**Internet**

No sound card required on reflector computer. It connects to Internet via high bandwidth connection with a static IP and simply repeats all received VoIP digital voice packets to all other connected nodes. Bandwidth needed is approx 50 kbps per connection

**Internet**

147.58 MHz Simplex

144.800

Parallel Printer Port for PTT & COS

Audio Card Mic & Speaker

**Ispeaker Imike**

Parallel Printer Port for PTT & COS

Audio Card Mic & Speaker

**Ispeaker Imike**

**Craig Davidson**          **K1BDX**          K1bdx@amsat.org
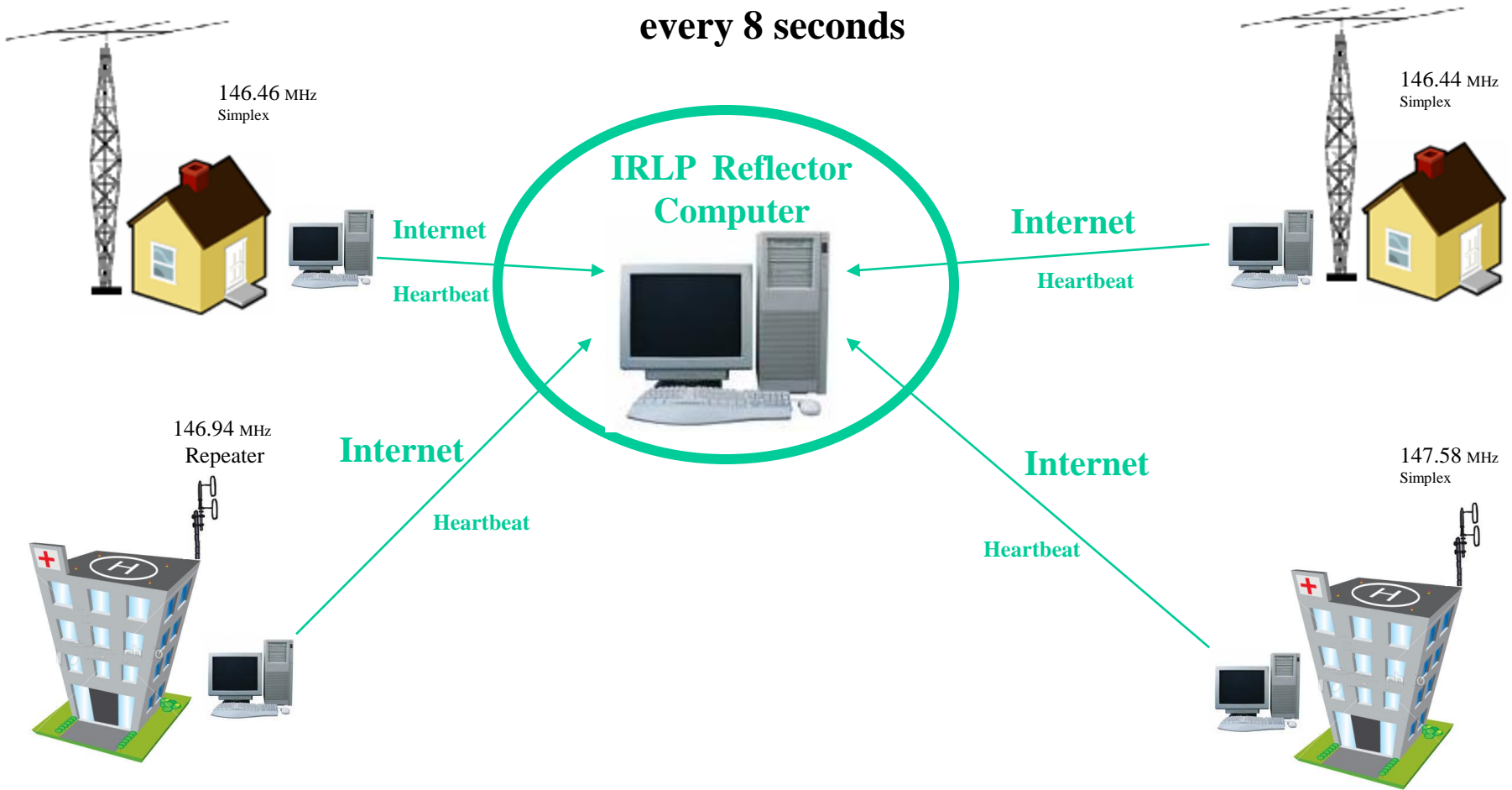
# IRLP reflector

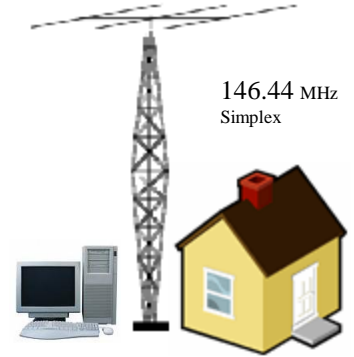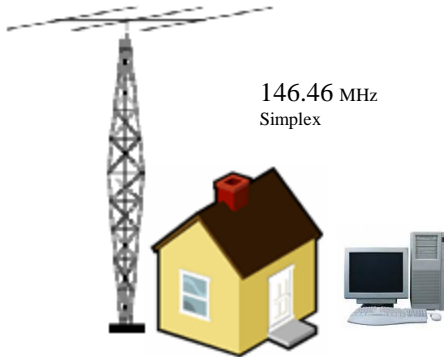**All connected nodes are listening to the reflector computer and also sending a short heartbeat signal every 8 seconds**



146.46 MHz
Simplex

146.44 MHz
Simplex

**IRLP Reflector Computer**

**Internet**

**Heartbeat**

**Internet**

**Heartbeat**

146.94 MHz
Repeater

**Internet**

**Heartbeat**

147.58 MHz
Simplex

**Internet**

**Heartbeat**

**Craig Davidson**          **K1BDX**          K1bdx@amsat.org

# IRLP reflector

## When no one is keyed up then no voice packets are flowing on the internet

## Everyone is listening

146.46 MHz
Simplex

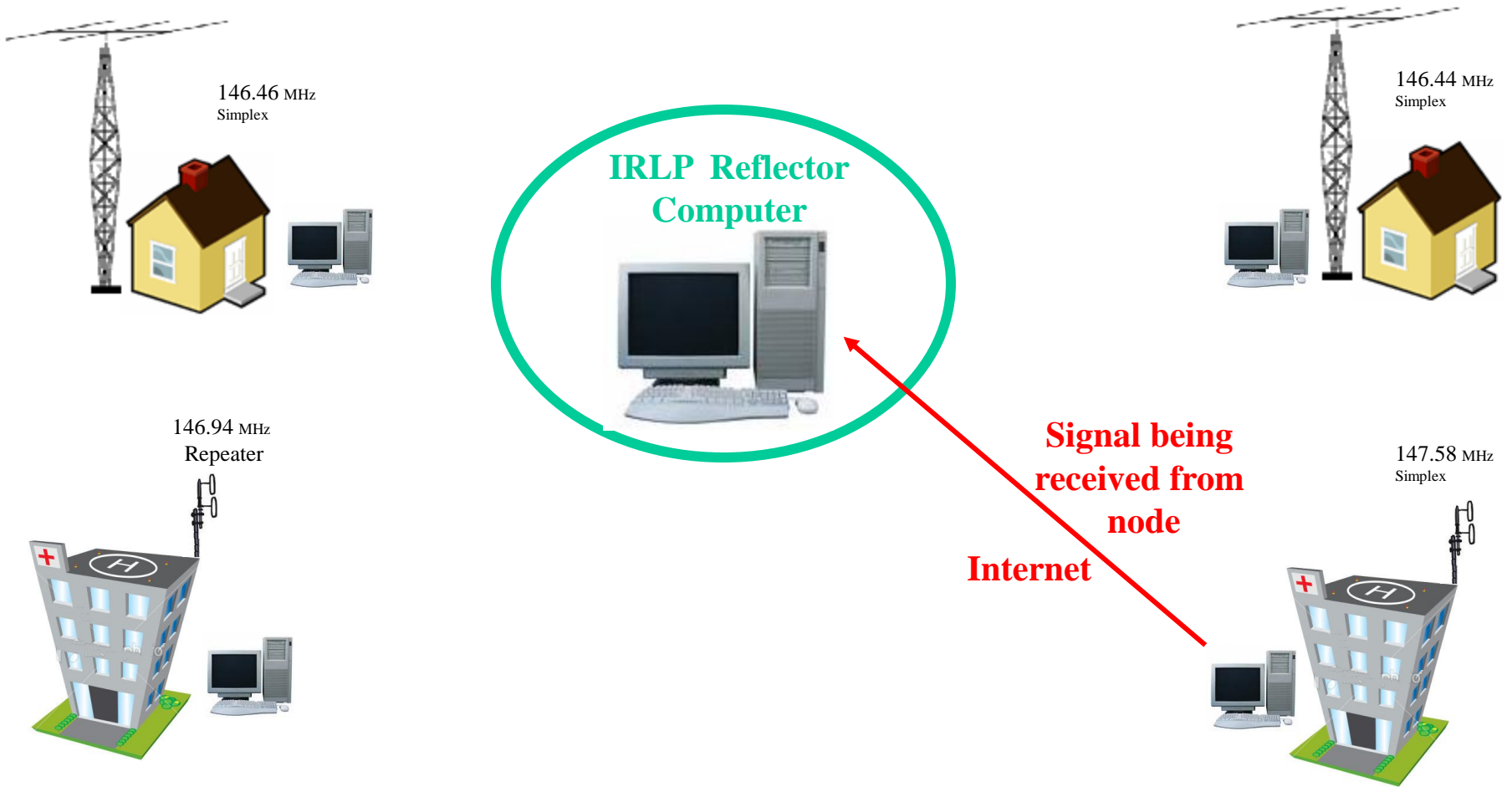146.44 MHz
Simplex

**IRLP Reflector Computer**

146.94 MHz
Repeater

147.58 MHz
Simplex

Only heartbeat signals every 8 seconds

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# IRLP reflector

## When a node keys up…

146.46 MHz
Simplex

146.44 MHz
Simplex

IRLP Reflector Computer

146.94 MHz
Repeater

147.58 MHz
Simplex

Signal being received from node

Internet

# IRLP reflector

## …then voice packets are copied and repeated to all other nodes by the reflector computer



146.46 MHz Simplex

146.44 MHz Simplex

**Signal being Repeated by reflector computer**

**IRLP Reflector Computer**

**Signal being Repeated by reflector computer**

**Internet**

146.94 MHz Repeater

**Signal being Repeated by reflector computer**

147.58 MHz Simplex

**Signal being received from node**

**Internet**

**Internet**

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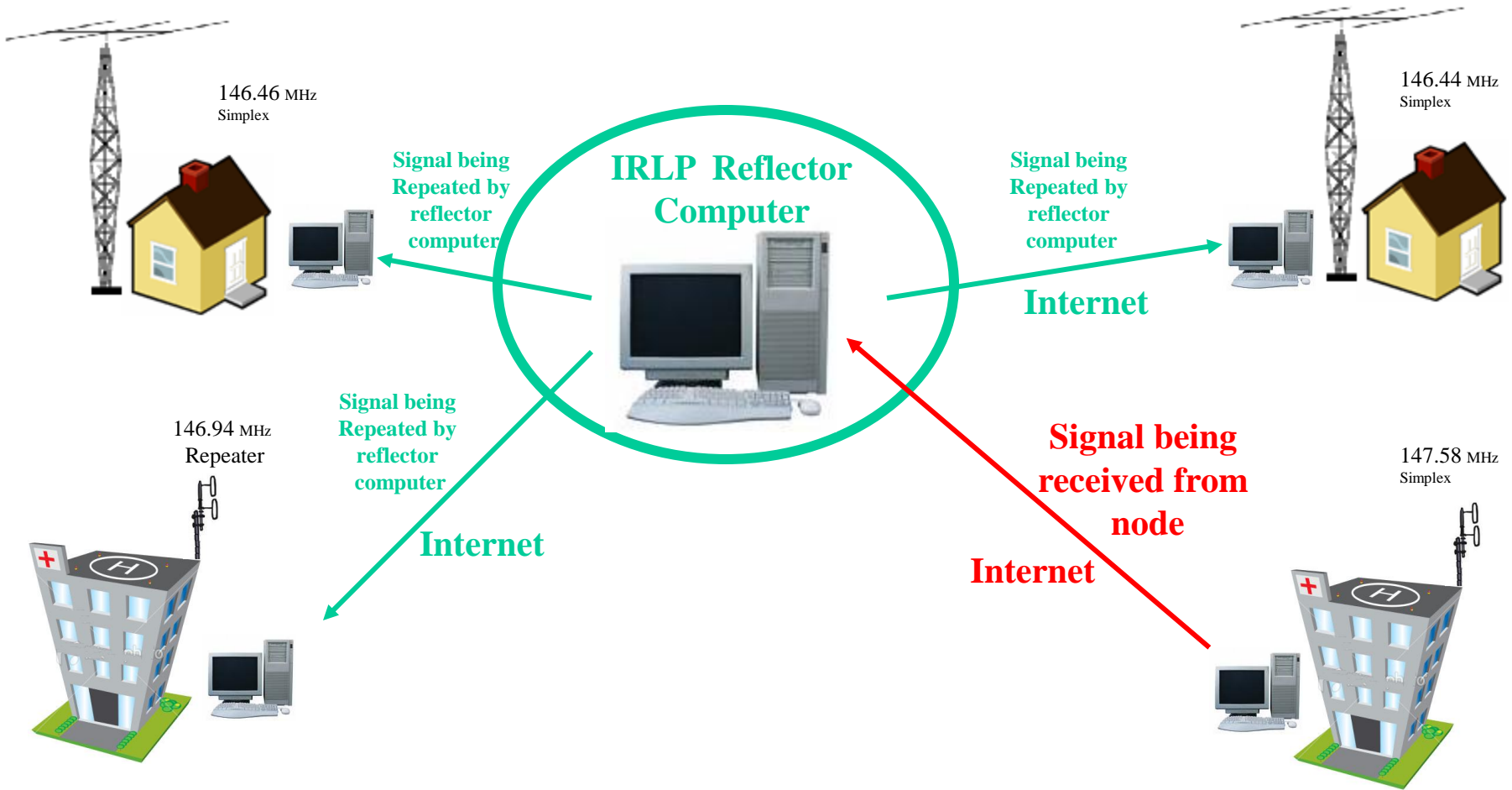
# IRLP reflector

## When that node unkeys…

146.46 MHz
Simplex

146.44 MHz
Simplex

**Signal being Repeated by reflector computer**

**IRLP Reflector Computer**

**Signal being Repeated by reflector computer**

**Internet**

146.94 MHz
Repeater

147.58 MHz
Simplex

**Signal being Repeated by reflector computer**

**Internet**

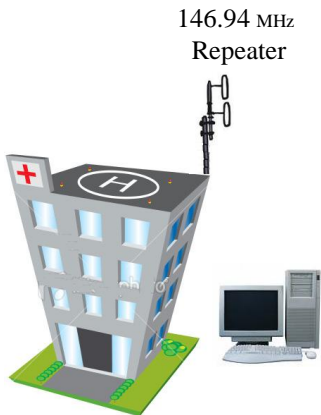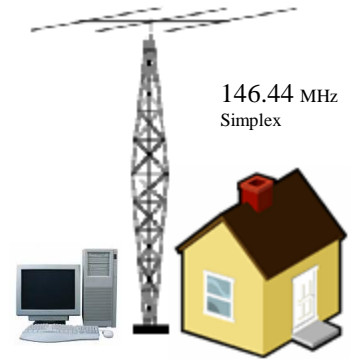**Craig Davidson**          **K1BDX**          K1bdx@amsat.org
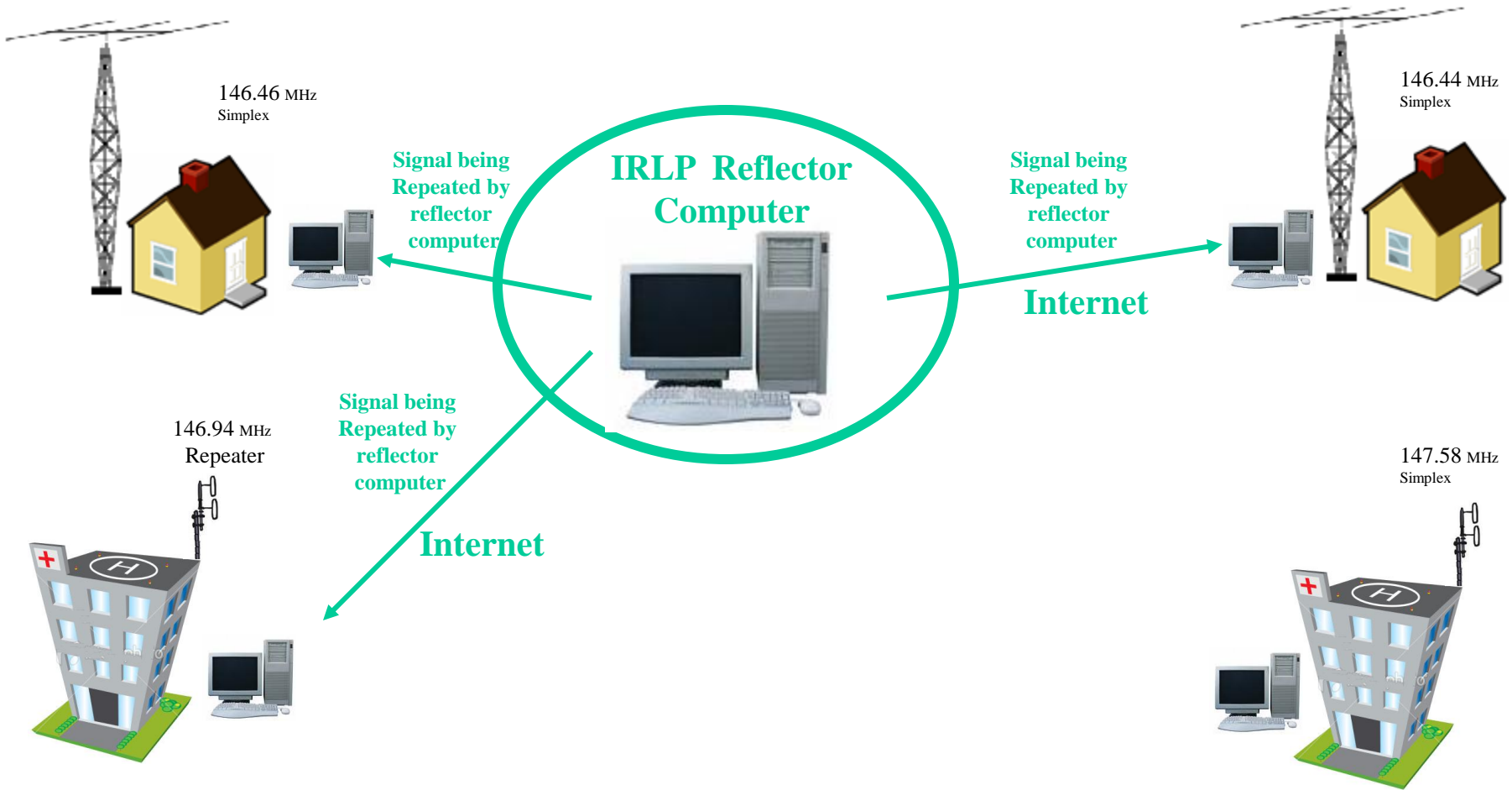
# IRLP reflector

## … Then the reflector stops repeating voice packets

## Everyone is listening

146.46 MHz
Simplex

146.44 MHz
Simplex

IRLP Reflector Computer

146.94 MHz
Repeater

147.58 MHz
Simplex

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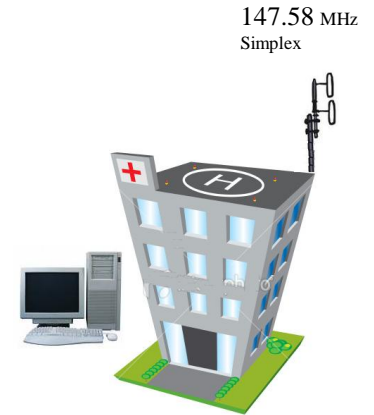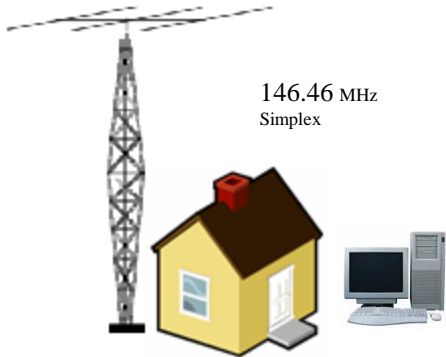
# IRLP reflector

## When another different node keys up…

146.46 MHz
Simplex

**Signal being received from node**

**IRLP Reflector Computer**

146.44 MHz
Simplex

**Internet**

146.94 MHz
Repeater

147.58 MHz
Simplex

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# IRLP reflector

## … then voice packets are copied and repeated to all other nodes.



146.46 MHz Simplex

**Signal being received from node**

Internet

**IRLP Reflector Computer**

**Signal being Repeated by reflector computer**

Internet

146.44 MHz Simplex

146.94 MHz Repeater

**Signal being Repeated by reflector computer**

Internet

**Signal being Repeated by reflector computer**

Internet

147.58 MHz Simplex

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# IRLP reflector

## When that second node unkeys…

146.46 MHz
Simplex

146.44 MHz
Simplex

IRLP Reflector Computer

Signal being Repeated by reflector computer

Internet

146.94 MHz
Repeater

Signal being Repeated by reflector computer

Internet

147.58 MHz
Simplex

Signal being Repeated by reflector computer

Internet

**Craig Davidson**          **K1BDX**          K1bdx@amsat.org
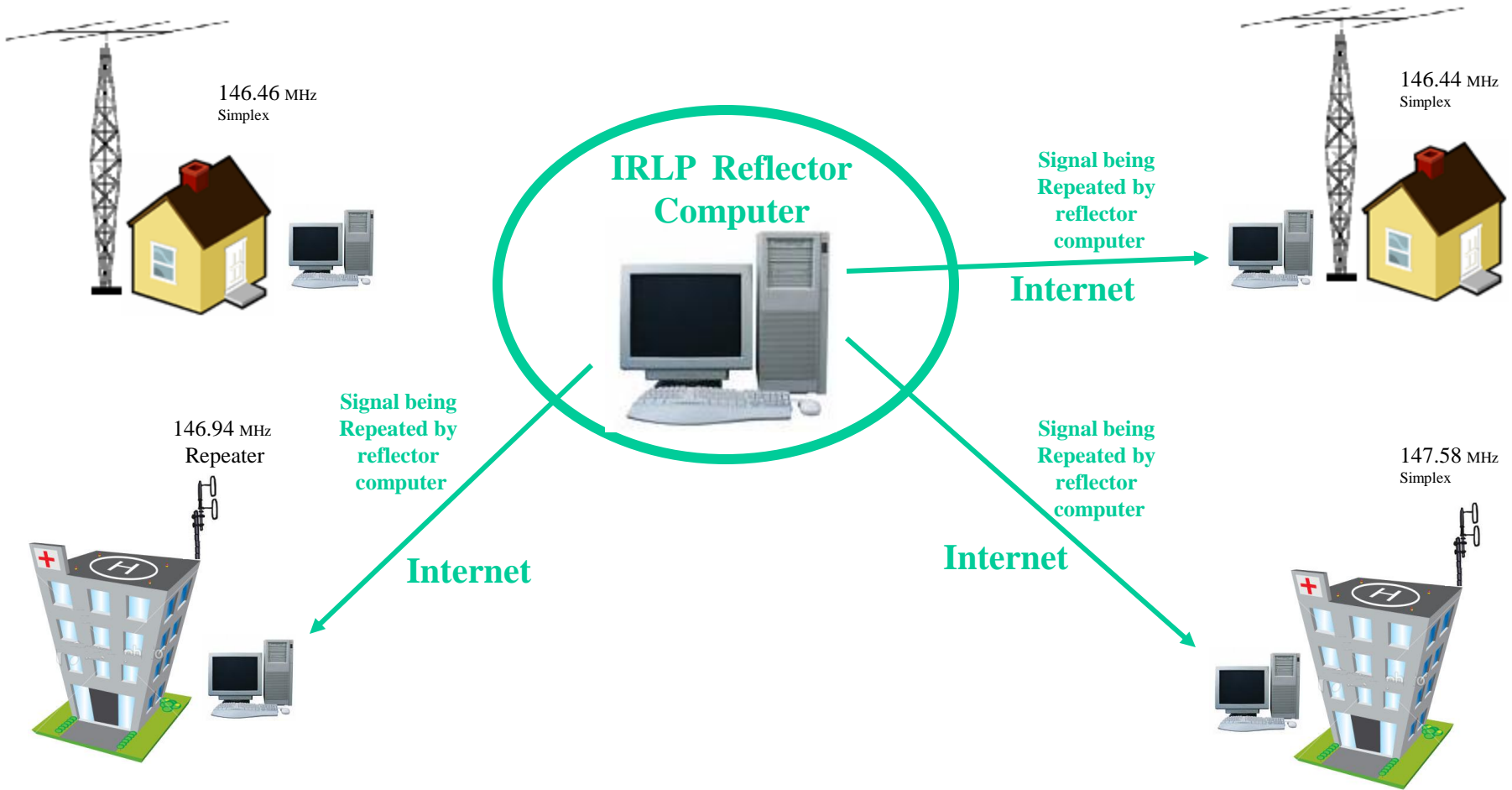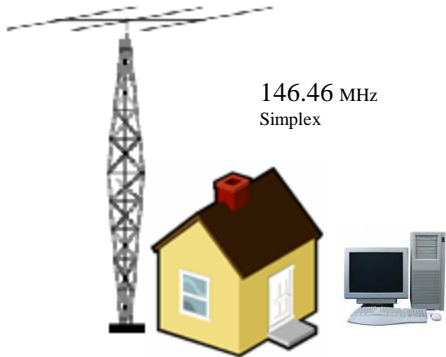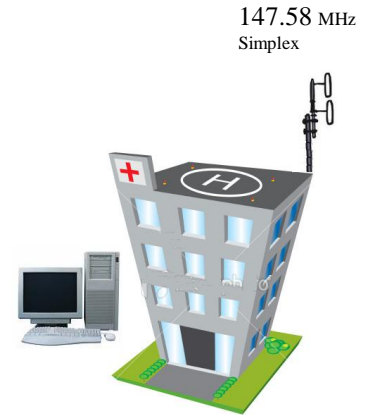
# IRLP reflector

**Then once again… no voice packets are flowing on the internet**

Only heartbeat signals every 8 seconds

146.46 MHz
Simplex

146.44 MHz
Simplex

**IRLP Reflector Computer**

146.94 MHz
Repeater

147.58 MHz
Simplex

**Everyone is listening**

**Craig Davidson**          **K1BDX**          K1bdx@amsat.org

# IRLP Interface Card

Sound Card

Speaker → Mic

Microphone ← Speaker

144.800

PTT    Squelch

Parallel Printer Port

IRLP Interface Board

Pins 10,12, 13, 15

DTMF decode chip

Pin 8

Pin 2

Pin 3

Pin 11

Pin 7

Power
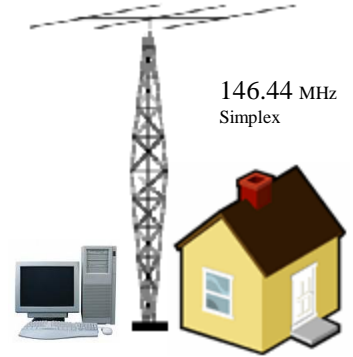
# IRLP connect/disconnect process

- **Always Listening**

- DTMF program always monitors COS and DTMF on parallel port from RF mobile station
- Call Listener program monitors TCP port 15425 for connect request from other node

- **Calling**

- Once detected DTMF sequence passed to the call script
- Server is asked for latest IP of node being called
- Irlp_call is started, and a TCP connection is made to the called node on port 15425
- Remote node starts irlp_answer in response to TCP call on port 15425
- PGP security performs a dual challenge to ensure calling node is an IRLP node
- Irlp_call and irlp_answer start speak freely software on UDP ports 2074 and 2075
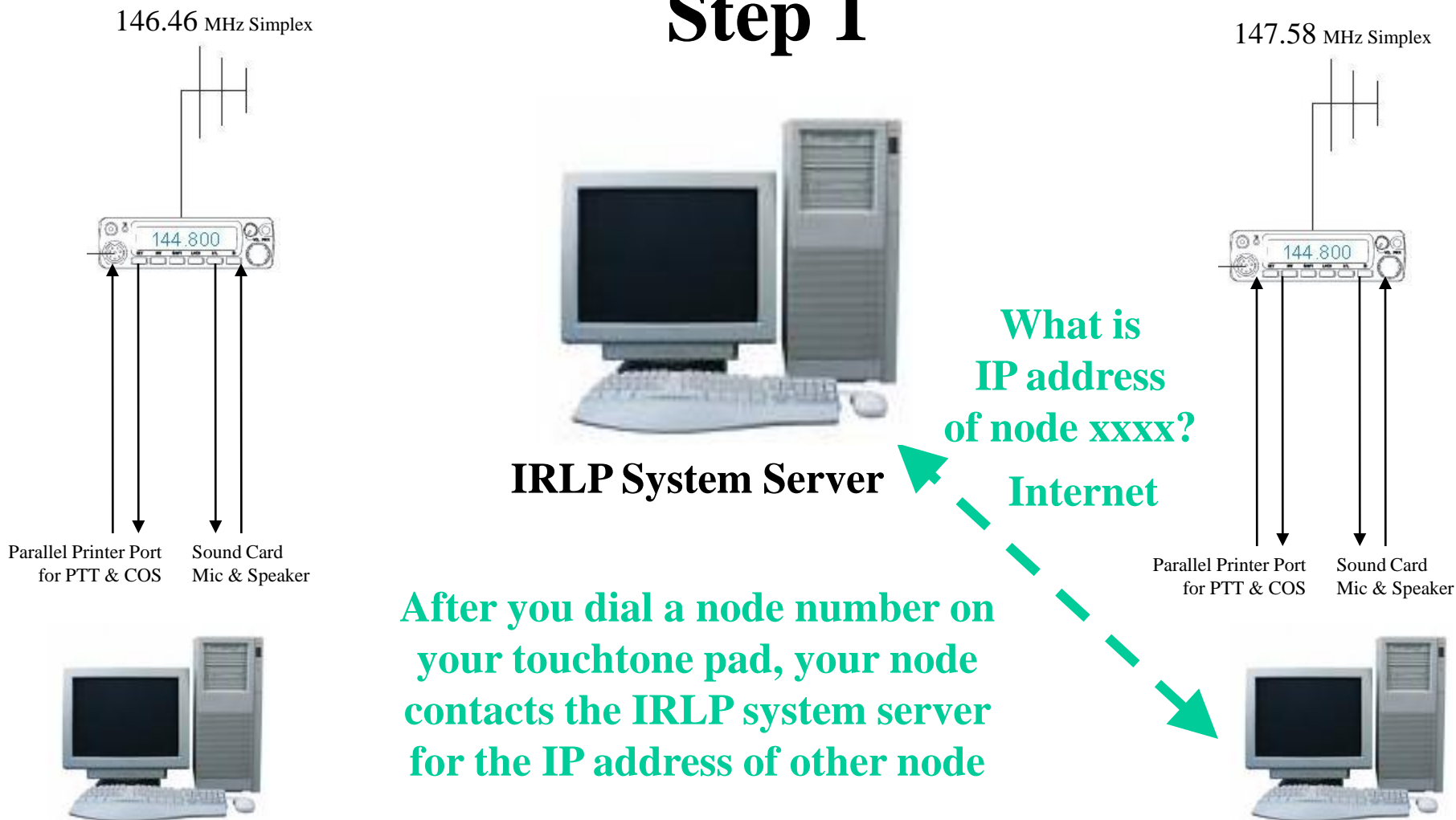
## During the Call

- Irlp_call and irlp_answer send keep-alives in the background. If keep-alive fails, the connection drops (every 15 sec)

- **Disconnect**

- Disconnecting node uses TCP info channel (port 15425) to send disconnect message.
- Unexpected drop in the TCP connection prompts reset of IRLP node
- If the timeout elapses, disconnect is sent
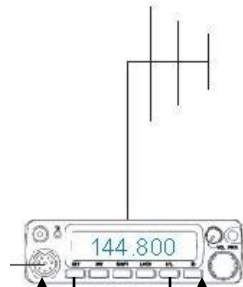
# What happens during connection
# Step 1

146.46 MHz Simplex

147.58 MHz Simplex

144.800

144.800

**IRLP System Server**

**What is IP address of node xxxx?**

**Internet**

Parallel Printer Port for PTT & COS

Sound Card Mic & Speaker

Parallel Printer Port for PTT & COS

Sound Card Mic & Speaker

**After you dial a node number on your touchtone pad, your node contacts the IRLP system server for the IP address of other node**

# What happens during connection
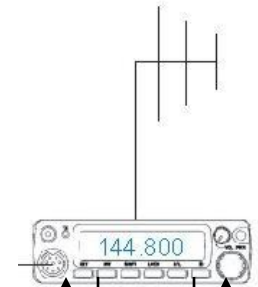# Step 2

146.46 MHz Simplex

144.800

Parallel Printer Port
for PTT & COS

Sound Card
Mic & Speaker

147.58 MHz Simplex

144.800

Parallel Printer Port
for PTT & COS

Sound Card
Mic & Speaker

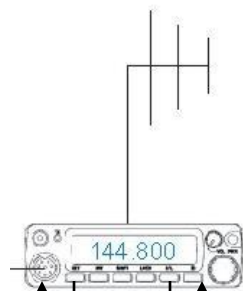**Your node then sends a connect request to the other node's IP address on port 15425**

**Internet**

**Craig Davidson**          **K1BDX**          K1bdx@amsat.org

# What happens during connection
# Step 3

146.46 MHz Simplex

147.58 MHz Simplex

144.800

144.800
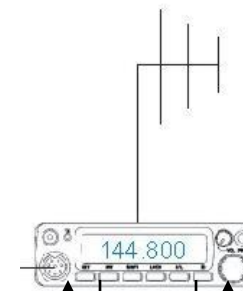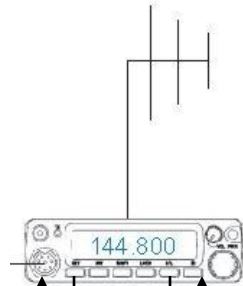
Parallel Printer Port
for PTT & COS

Sound Card
Mic & Speaker

Parallel Printer Port
for PTT & COS

Sound Card
Mic & Speaker

**The other challenges you for your
PGP encryption key on port 15425**

**Internet**

**Craig Davidson**         **K1BDX**         K1bdx@amsat.org

# What happens during connection
# Step 4

146.46 MHz Simplex

147.58 MHz Simplex

144.800

144.800

**Ispeaker and Imike are then started in each node and voice communications can begin**
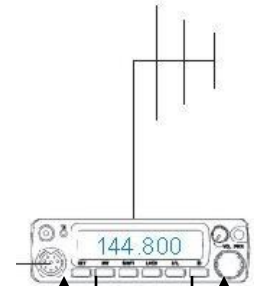
Parallel Printer Port
for PTT & COS

Sound Card
Mic & Speaker

Parallel Printer Port
for PTT & COS

Sound Card
Mic & Speaker

**Internet**

**Imike**

**Ispeaker**

**UDP voice packets**

**Ispeaker**

**Imike**

# What happens during connection
# Step 5

146.46 MHz Simplex

147.58 MHz Simplex

144.800

144.800

**Please update my status on your web page**

**Please update my status on your web page**

**IRLP System Server**

Parallel Printer Port for PTT & COS

Sound Card Mic & Speaker

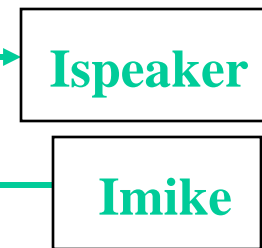Parallel Printer Port for PTT & COS

Sound Card Mic & Speaker

**After the connection begins both your node and the other node send update messages to the IRLP system server web page**

**Craig Davidson**

**K1BDX**

K1bdx@amsat.org

# Where to get the software

## Download Linux Centos 4

Download for free and make your own ISO boot disk

http://mirror.irlp.net/iso/IRLP_CD_7.08.iso

http://irlp.net/new-install/IRLP_OS_Installation_COS44.pdf

## Boot from CD ROM on old windows computer

Erase all old software and partitions on old computer

Log into Centos 4 computer and download IRLP software

/root/get-irlp-files

If this is not a new install then you must have an IRLP backup file

in the TMP folder

Experimental nodes are free but <span style="color:red">If you want a registered node with a node number you must first buy an interface card</span> ($123) before you install with  /root/get-irlp-files      You can order here:   http://irlp.net/orderform.html

Speak Freely software developed by John Walker in 1995 and released to the Public domain:

   http://www.fourmilab.ch/speakfree/eol/

David Cameron in Vancouver Canada modified the source code:

   Ispeaker keys transmitter via pin 3 of the parallel printer port when packets received.
   Imike looks for pin 11 shorted to ground to begin sending VIOP packets

General information for IRLP

   http://irlp.net

Status page for all nodes and reflectors:

   http://status.irlp.net

After the node is installed:

   http://irlp.net/new-install/Ver3_Wiring.pdf

   http://irlp.net/new-install/afterinstallv2.pdf

# Required Computer Hardware

Old cheap (or free) computers seem to work better than new ones

    300 MHz processor is fine

    128 megabytes of RAM is fine

    Parallel port and Ethernet interface required

        Serial port is not used

  only a 2 Gigabyte hard drive is required.

        Hard to find one that small these days.

        Centos 4 can't seem to run on a drive bigger than 120 gig

        Consider a 2 gig solid state hard drive for $25

VIA computers (Canadian Company)

    Lots of good deals on Ebay

Craig Davidson        K1BDX        K1bdx@amsat.org

# Craig's Opinions

(He seems to have a lot of 'em!)

## An idle node is a wasted node

**Find a reflector channel you like and hang out there.**

> Disconnect only if local conversation (or node to node connection) is desired
>
> When finished go back to reflector
>
> You won't know whats happening on the reflector unless you are connected

## No Channel Surfing – This isn't your TV remote control

**If you connect to a reflector then stay there a while**

**Make sure you listen for AT LEAST 60 SECONDS before talking**

**Do not interrupt ongoing conversations.  Wait, Listen, then join in.**

# Advanced Topics

**Repeaters as nodes**

**Mobile nodes**

**Echoirlp**

**Remote Admin Web page**

**Personal web page**

**Experimental nodes and reflectors**

**GPS / APRS reporting node location**

**Remote commanding with Icom C-IV port**

# The End