Installing SVXLink On Raspberry Pi OS Bullseye

-by Cliff Linton VE6PLC (revised April 2024)

When I first set up an EchoLink node on a Raspberry Pi using SVXLink software by SM0SVX (https://www.svxlink.org/), I found it a challenge. There were several sets of instructions on the internet and some tips and tricks to use along the way, but I didn't find one document that worked for me from end-to-end. For my own peace of mind and so I could recreate a working EchoLink node should the need ever arise, I built a new microSD card from scratch and made the following set of instruction. After the instructions are some of the useful tips and tricks that helped me with my initial build. Thanks to G4NAB/F5VMR whose instructions formed the basis for the steps of this document.

1. Download Raspberry Pi OS Imager program from https://www.raspberrypi.com/software/ and install it.

2. For my RPi 3B, I chose the Raspbery Pi OS (Legacy, 32 bit) OS (Bullseye) to write to the microSD card (I used a 32GB card). I also chose to Customize the installation with a username and password, and enabled SSH access.

3. Log in to your RPi using an SSH client like PuTTY and type sudo raspi-config. Set time zone, locale, screen resolution for Headless operation (I used 1280x720) and under Interfaces, enable VNC.

4. Type sudo adduser svxlink. Use svxlink as the password. This user is needed by SVXLink.

5. Type sudo apt-get update then sudo apt-get upgrade to bring Bullseye up to the current level. The upgrade may take a while.

6. Type sudo apt install svxlink-server to install SVXLink from the repository.
   Alternatively you can install SVXLink from source code. See section below for commands. Note: I have not verified those steps!

7. Add the Voice Sounds. The English voice sounds are added using the following commands:
   cd /usr/share/svxlink/sounds/
   sudo curl -LO https://github.com/sm0svx/svxlink-sounds-en_US-heather/releases/download/24.02/svxlink-sounds-en_US-heather-16k-24.02.tar.bz2
   sudo tar xvjf svxlink-sounds-en_US-heather-16k-24.02.tar.bz2
   sudo ln -s en_US-heather-16k en_US

8. Setup GPIO pin 17 for PTT (and optionally pin 18 for Squelch): sudo nano /etc/rc.local Add the following lines between fi and exit 0
   ################
   #GPIO SCRIPT #
   #TO BE INSERTED#
   #ON START-UP #
   ################
   # GPIO 17 as PTT to TX1 echo 17 > /sys/class/gpio/export echo out >

sys/class/gpio/gpio17/direction
#sudo chmod 777 /sys/class/gpio/gpio17/value

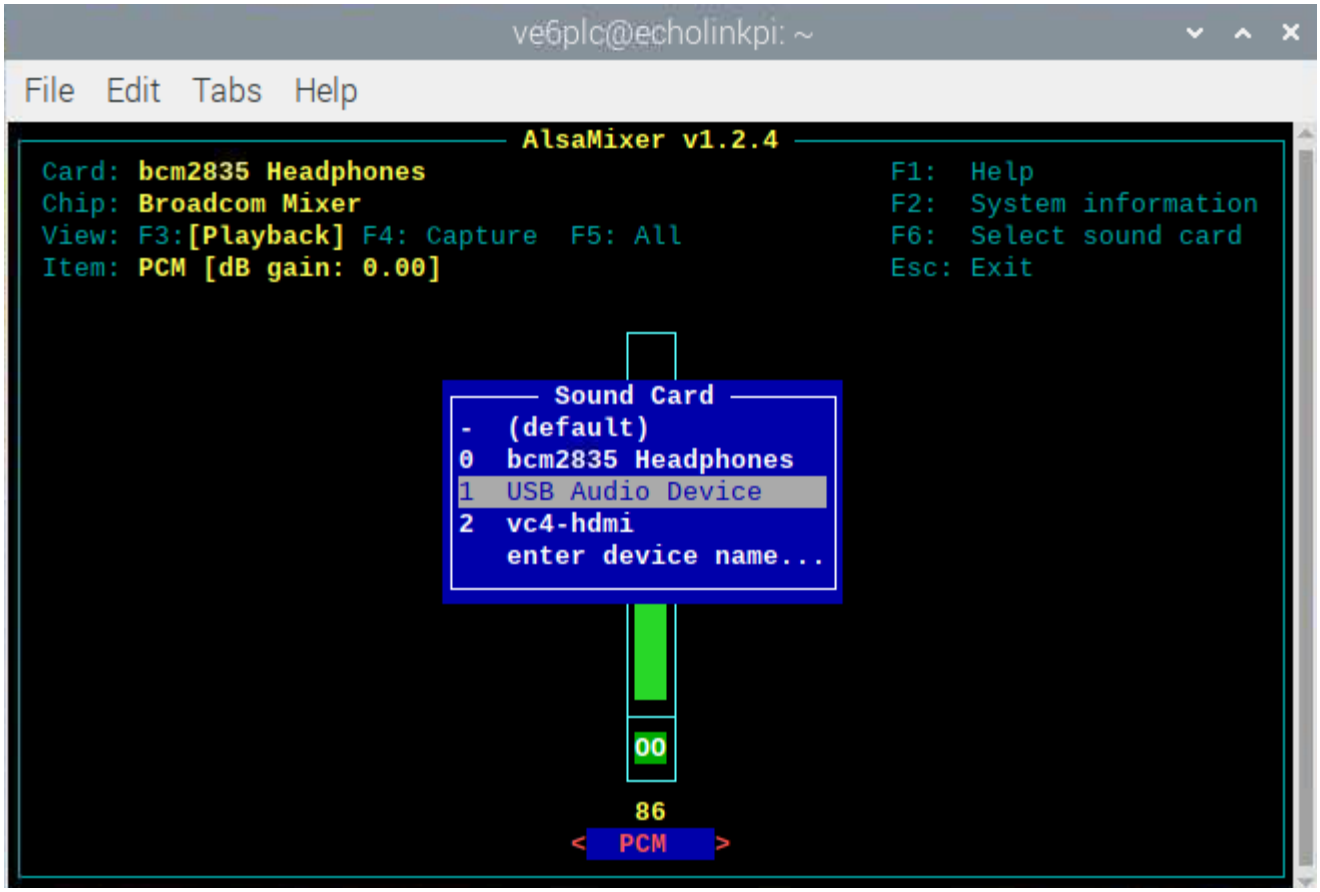
GPIO 18 as Squelch to RX1 echo 18 > /sys/class/gpio/export echo in > /sys/class/gpio/gpio18/direction
#sudo chmod 777 /sys/class/gpio/gpio18/value

9. Define gpio17 in /etc/svxlink/gpio.conf
   sudo nano /etc/svxlink/gpio.conf
   GPIO_OUT_HIGH="gpio17"
   Note: GPIO_USER="svxlink" should already be set in gpio.conf

10. Use the arecord -l command to list input devices. The USB Audio Device should be card 1 and device 0. If it shows something different, then change the settings in svxlink.conf under Rx1 and Tx1.

11. Reboot to enable the changes.

12. Type sudo alsamixer to open the volume controls for the sound card. Our USB Audio Device should be listed as device 1. Press F6 to bring up the list and select 1 USB Audio Device.



Press F5 to show all the volume controls. For my setup, I set the Speaker and Capture Mic levels to 38 to get good sound to and from the radio.
Press Esc to exit the mixer. Save these settings (even after rebooting) by typing sudo alsactl store
Reboot to enable the changes.

13. The final steps are to set the parameters in /etc/svxlink/svxlink.conf and /etc/svxlink/svxlink.d/ModuleEchoLink.conf to enable your installation, paying attention to syntax and whether you are operating simplex or duplex. I have included my working settings for a simplex node at the end of this document.

Building SVXLink from Source Code

Load packages (verified for Raspberry Pi OS Lite 32-bit 2023-08-22)

```
sudo apt update
sudo apt install g++ cmake make libsigc++-2.0-dev libgsm1-dev libpopt-dev tcl-dev
libgcrypt20-dev libspeex-dev libasound2-dev libopus-dev librtlsdr-dev doxygen groff
alsa-utils vorbis-tools curl libcurl4-openssl-dev git rtl-sdr libcurl4-openssl-dev
cmake libjsoncpp-dev libgpiod-dev
```

Create svxlink user and add to groups

```
sudo useradd -rG audio,plugdev,gpio,dialout svxlink
```

Download the software from Github and compile

```
git clone http://github.com/sm0svx/svxlink.git
mkdir svxlink/src/build
cd svxlink/src/build
cmake -DUSE_QT=OFF -DCMAKE_INSTALL_PREFIX=/usr -DSYSCONF_INSTALL_DIR=/etc -
DLOCAL_STATE_DIR=/var -DWITH_SYSTEMD=ON ..
make -j4
make doc
sudo make install
sudo ldconfig
```

Tips and Tricks

The following tips and trick proved helpful in testing various functions and in completing the setup of the node.

Configuring RPi to run svxlink at startup (Buster and Bullseye)

Step 1. Create a script:
sudo nano /etc/xdg/lxsession/LXDE-pi/svxlink_start.sh

#!/bin/bash
lxterminal -e svxlink
Ctrl-O to save the file then Ctrl-X to exit. This script will start SVXLink in a terminal window.

sudo chmod 777 /etc/xdg/lxsession/LXDE-pi/svxlink_start.sh
This command makes the script executable and modifiable by anyone. You can change it from the File Manager window, also.

Step 2. To run the script at startup, create a new file with the following lines:

sudo nano /etc/xdg/autostart/svxlink_start.desktop

```
[Desktop Entry]
Type=Application
Name=svxlink_start
Comment=start svxlink in terminal window
NoDisplay=true
Terminal=true
X-KeepTerminal=true
Exec=sh /etc/xdg/lxsession/LXDE-pi/svxlink_start.sh
```

Ctrl-O to save the file then Ctrl-X to exit.
When the RPi is started, SVXLink will start in a terminal window.

Sound Test

Test to see if sound works: `$ speaker-test -c 2`

Change `-c` to fit your speaker setup. Use `-c 8` for 7.1, for instance: `$ speaker-test -c 8`

Playing a Wave File

To download a test file: sudo wget
http://www.freespecialeffects.co.uk/soundfx/sirens/police_s.wav

To play the file: sudo aplay police_s.wav

Testing PTT GPIO Pin

Below is a Python script for testing the PTT pin (GPIO17). Create a new text file “PTT.py”.

nano PTT.py

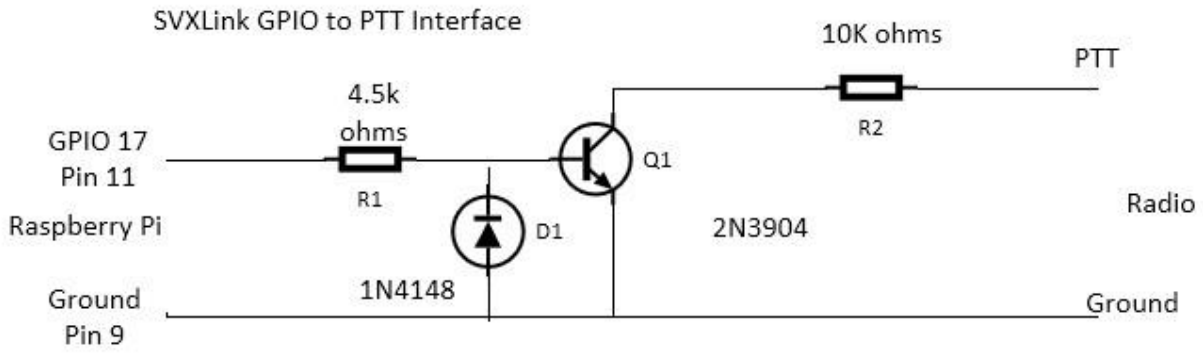
Type in the following code:

```
import RPi.GPIO as GPIO
import time
GPIO.setmode(GPIO.BCM)
GPIO.setwarnings(False)
GPIO.setup(17,GPIO.OUT)
print("PTT on")
GPIO.output(17,GPIO.HIGH)
time.sleep(2)
print("PTT off")
GPIO.output(17,GPIO.LOW)
GPIO.cleanup()
```

Once you have typed all the code and checked it, save and exit the text editor with “Ctrl + x” then “y” then “enter”. To run the code, type sudo python PTT.py.

Connecting GPIO Pin 17 to the Radio’s PTT Line

The interface circuit consists of a 2N3904 transistor, a 4.7k ohm resistor, a 10k ohm resistor, and a 1N4148 diode.



Watching the SVXLink Log (Real Time)

If you want to create a log file that can be saved and viewed, then start SVXLink with logging enabled: sudo svxlink --logfile=/var/log/svxlink.log

Open up a second terminal window. From the command line issue the following command to view the log: tail -f /var/log/svxlink.log

This will add new lines real time and scroll as the log grows. To exit just type Ctrl+C

The log file records every connection and every incoming and outgoing signal, so if you are using an 8GB microSD card, you don’t want to have logging turned on all the time. I recommend using it only for troubleshooting and moving the file to a USB drive from time to time or deleting it after reviewing.

Monitor logfile

```
tail -f /var/log/svxlink
```

SVXLink Configuration Settings

Since there was no internet connection at the site of the repeater, we set up a remote EchoLink node at my house, on the repeater’s TX and Rx frequencies. The node is registered with EchoLink under my call sign (VE6PLC) but is configured to announce the repeater’s call sign

(VA6CAL). Below are the svxlink.conf settings in use for the VA6CAL/VE6PLC-R remote EchoLink node.

sudo nano /etc/svxlink/svxlink.conf

```
##############################################################################
#                                                            #
#            Configuration file for the SvxLink server               #
#                                                            #
##############################################################################

[GLOBAL]

#MODULE_PATH=/usr/lib/arm-linux-gnueabihf/svxlink

LOGICS=SimplexLogic

CFG_DIR=svxlink.d

TIMESTAMP_FORMAT="%c"

CARD_SAMPLE_RATE=48000

#CARD_CHANNELS=1

LOCATION_INFO=LocationInfo

#LINKS=LinkToR4


[SimplexLogic]

TYPE=Simplex

RX=Rx1

#RX=NONE

TX=Tx1

#MODULES=ModuleHelp,ModuleParrot,ModuleEchoLink

MODULES=ModuleHelp,ModuleEchoLink

CALLSIGN=ER-VA6CAL

#CALLSIGN=ER-VE6PLC
```

SHORT_IDENT_INTERVAL=0

LONG_IDENT_INTERVAL=60

#IDENT_ONLY_AFTER_TX=4

#EXEC_CMD_ON_SQL_CLOSE=500

EVENT_HANDLER=/usr/share/svxlink/events.tcl

DEFAULT_LANG=en_US

#RGR_SOUND_DELAY=0

RGR_SOUND_DELAY=-1

REPORT_CTCSS=110.9

#TX_CTCSS=ALWAYS

TX_CTCSS=MODULE,LOGIC,ANNOUNCEMENT

MACROS=Macros

FX_GAIN_NORMAL=0

FX_GAIN_LOW=-12

#ACTIVATE_MODULE_ON_LONG_CMD=4:EchoLink

#QSO_RECORDER=8:QsoRecorder

ONLINE_CMD=998877

MUTE_RX_ON_TX=1

MUTE_TX_ON_RX=1

#STATE_PTY=/var/run/svxlink/state

[RepeaterLogic]

TYPE=Repeater

RX=Rx1

```
TX=Tx1

#MODULES=ModuleHelp,ModuleParrot,ModuleEchoLink,ModuleTclVoiceMail
MODULES=ModuleHelp,ModuleParrot,ModuleEchoLink

CALLSIGN=MYCALL

SHORT_IDENT_INTERVAL=10

LONG_IDENT_INTERVAL=60

#IDENT_ONLY_AFTER_TX=4

#EXEC_CMD_ON_SQL_CLOSE=500

EVENT_HANDLER=/usr/share/svxlink/events.tcl

DEFAULT_LANG=en_US

RGR_SOUND_DELAY=0

REPORT_CTCSS=136.5

#TX_CTCSS=SQL_OPEN

MACROS=Macros

#SEL5_MACRO_RANGE=03400,03499

FX_GAIN_NORMAL=0

FX_GAIN_LOW=-12

#QSO_RECORDER=8:QsoRecorder

#NO_REPEAT=1

IDLE_TIMEOUT=30

OPEN_ON_1750=1000

#OPEN_ON_CTCSS=136:2000

#OPEN_ON_DTMF=*

#OPEN_ON_SQL=5000

#OPEN_ON_SEL5=01234
```

#OPEN_SQL_FLANK=OPEN #OPEN_ON_SQL_AFTER_RPT_CLOSE=10

IDLE_SOUND_INTERVAL=3000

#SQL_FLAP_SUP_MIN_TIME=1000

#SQL_FLAP_SUP_MAX_COUNT=10

#ACTIVATE_MODULE_ON_LONG_CMD=4:EchoLink

#IDENT_NAG_TIMEOUT=15

#IDENT_NAG_MIN_TIME=2000

#ONLINE_CMD=998877

#STATE_PTY=/var/run/svxlink/state

[LinkToR4]

CONNECT_LOGICS=RepeaterLogic:94:SK3AB,SimplexLogic:92:SK3CD

#DEFAULT_ACTIVE=1

TIMEOUT=300

6#AUTOACTIVATE_ON_SQL=RepeaterLogic

[Macros]

1=EchoLink:9999#

7=EchoLink:51068#

8=EchoLink:496228#

9=EchoLink:455453#

03400=EchoLink:9999#

[QsoRecorder]

#REC_DIR=/var/spool/svxlink/qso_recorder

#MIN_TIME=1000

#MAX_TIME=3600

#SOFT_TIME=300

#MAX_DIRSIZE=1024

#DEFAULT_ACTIVE=1

#TIMEOUT=300

#QSO_TIMEOUT=300

#ENCODER_CMD=/usr/bin/oggenc -Q \"%f\" && rm \"%f\"

[Voter]

TYPE=Voter

RECEIVERS=Rx1,Rx2,Rx3

VOTING_DELAY=200

BUFFER_LENGTH=0

#REVOTE_INTERVAL=1000

#HYSTERESIS=50

#SQL_CLOSE_REVOTE_DELAY=500

#RX_SWITCH_DELAY=500

[MultiTx]

#TYPE=Multi

#TRANSMITTERS=Tx1,Tx2,Tx3

[NetRx]

```
TYPE=Net
HOST=remote.rx.host
TCP_PORT=5210
#LOG_DISCONNECTS_ONCE=0
AUTH_KEY="Change this key now!"
CODEC=S16
#SPEEX_ENC_FRAMES_PER_PACKET=4
#SPEEX_ENC_QUALITY=4
#SPEEX_ENC_BITRATE=15000
#SPEEX_ENC_COMPLEXITY=2
#SPEEX_ENC_VBR=0
#SPEEX_ENC_VBR_QUALITY=4
#SPEEX_ENC_ABR=15000
#SPEEX_DEC_ENHANCER=1
#OPUS_ENC_FRAME_SIZE=20
#OPUS_ENC_COMPLEXITY=10
#OPUS_ENC_BITRATE=20000
#OPUS_ENC_VBR=1

[NetTx]
TYPE=Net
HOST=remote.tx.host
TCP_PORT=5210
#LOG_DISCONNECTS_ONCE=0
```

```
AUTH_KEY="Change this key now!"
CODEC=S16
#SPEEX_ENC_FRAMES_PER_PACKET=4
#SPEEX_ENC_QUALITY=4
#SPEEX_ENC_BITRATE=15000
#SPEEX_ENC_COMPLEXITY=2
#SPEEX_ENC_VBR=0
#SPEEX_ENC_VBR_QUALITY=4
#SPEEX_ENC_ABR=15000
#SPEEX_DEC_ENHANCER=1
#OPUS_ENC_FRAME_SIZE=20
#OPUS_ENC_COMPLEXITY=10
#OPUS_ENC_BITRATE=20000
#OPUS_ENC_VBR=1

[Rx1]
TYPE=Local
#AUDIO_DEV=alsa:plughw:1,0
AUDIO_DEV=alsa:plughw:2,0
AUDIO_CHANNEL=0
#AUDIO_DEV_KEEP_OPEN=0
SQL_DET=VOX
#SQL_DET=CTCSS
#SQL_START_DELAY=0
```

SQL_START_DELAY=10

SQL_DELAY=0

SQL_HANGTIME=2000

#SQL_EXTENDED_HANGTIME=1000

#SQL_EXTENDED_HANGTIME_THRESH=15

SQL_TIMEOUT=600

VOX_FILTER_DEPTH=20

VOX_THRESH=500

CTCSS_MODE=2

CTCSS_FQ=110.9

CTCSS_SNR_OFFSET=0

CTCSS_OPEN_THRESH=15

CTCSS_CLOSE_THRESH=9

CTCSS_BPF_LOW=60

CTCSS_BPF_HIGH=270

#SERIAL_PORT=/dev/ttyS0

#SERIAL_PIN=CTS

#SERIAL_SET_PINS=DTR!RTS

#EVDEV_DEVNAME=/dev/input/by-id/usb-SYNIC_SYNIC_Wireless_Audio-event-if03

#EVDEV_OPEN=1,163,1

#EVDEV_CLOSE=1,163,0

#GPIO_SQL_PIN=gpio30

#PTY_PATH=/tmp/rx1_sql

#HID_DEVICE=/dev/hidraw3

#HID_SQL_PIN=VOL_UP

#SIGLEV_DET=TONE

#SIGLEV_SLOPE=1

#SIGLEV_OFFSET=0

#SIGLEV_BOGUS_THRESH=120

#TONE_SIGLEV_MAP=100,84,60,50,37,32,28,23,19,8

#SIGLEV_OPEN_THRESH=30

#SIGLEV_CLOSE_THRESH=10

DEEMPHASIS=0

#SQL_TAIL_ELIM=300

#PREAMP=6

PEAK_METER=1

DTMF_DEC_TYPE=INTERNAL

DTMF_MUTING=1

DTMF_HANGTIME=40

DTMF_SERIAL=/dev/ttyS0

#DTMF_PTY=/tmp/rx1_dtmf

#DTMF_MAX_FWD_TWIST=8

#DTMF_MAX_REV_TWIST=4 #1750_MUTING=1

#SEL5_DEC_TYPE=INTERNAL

#SEL5_TYPE=ZVEI1

#FQ=433475000

#MODULATION=FM

#WBRX=WbRx1

```
[WbRx1]

#TYPE=RtlUsb

#DEV_MATCH=0

#HOST=localhost

#PORT=1234

#CENTER_FQ=435075000

#FQ_CORR=0

#GAIN=0

#PEAK_METER=1

#SAMPLE_RATE=960000


[Tx1]

TYPE=Local

#AUDIO_DEV=alsa:plughw:1,0

AUDIO_DEV=alsa:plughw:2,0

AUDIO_CHANNEL=0

#AUDIO_DEV_KEEP_OPEN=0

PTT_TYPE=GPIO

#PTT_TYPE=NONE

#PTT_PORT=/dev/ttyS0

GPIO_PATH=/sys/class/gpio

PTT_PIN=gpio17

#PTT_PIN=DTRRTS
```

#HID_DEVICE=/dev/hidraw3

#HID_PTT_PIN=GPIO3 #SERIAL_SET_PINS=DTR!RTS

#PTT_HANGTIME=1000

PTT_HANGTIME=500

TIMEOUT=300

TX_DELAY=500

CTCSS_FQ=110.9

CTCSS_LEVEL=9

PREEMPHASIS=0

DTMF_TONE_LENGTH=100

DTMF_TONE_SPACING=50

DTMF_DIGIT_PWR=-15

#MASTER_GAIN=1.0

MASTER_GAIN=0.0

[LocationInfo]

#APRS_SERVER_LIST=euro.aprs2.net:14580

#STATUS_SERVER_LIST=aprs.echolink.org:5199

LON_POSITION=114.08.00W

LAT_POSITION=51.08.00N

#CALLSIGN=ER-VE6PLC

CALLSIGN=ER-VA6CAL

FREQUENCY=147.135

TX_POWER=10

#ANTENNA_GAIN=6

#ANTENNA_HEIGHT=20m

#ANTENNA_DIR=-1

PATH=WIDE1-1

BEACON_INTERVAL=10

TONE=110

ModuleEchoLink.conf

sudo nano etc/svxlink/svxlink.d/ModuleEchoLink.conf

[ModuleEchoLink]

NAME=EchoLink

ID=2

TIMEOUT=60

#ALLOW_IP=192.168.1.0/24

#DROP_INCOMING=^()$

#REJECT_INCOMING=^()$

#ACCEPT_INCOMING=^(.*)$

#REJECT_OUTGOING=^()$

#ACCEPT_OUTGOING=^(.*)$

#REJECT_CONF=0

#CHECK_NR_CONNECTS=2,300,120

SERVERS=servers.echolink.org

CALLSIGN=VE6PLC-R

PASSWORD=eP1gOwkeXR85

SYSOPNAME=Cliff Linton

LOCATION=[Svx] Calgary, Alberta

#PROXY_SERVER=the.proxy.server

```
#PROXY_PORT=8100
#PROXY_PASSWORD=PUBLIC
#BIND_ADDR=10.20.30.40
MAX_QSOS=10
MAX_CONNECTIONS=11
LINK_IDLE_TIMEOUT=300
#AUTOCON_ECHOLINK_ID=9999
#AUTOCON_TIME=1200
#USE_GSM_ONLY=1
#DEFAULT_LANG=en_US
DESCRIPTION="You have connected to a SvxLink node,\n"
            "a voice services system for Linux with EchoLink\n"
            "support.\n"
            "Check out http://svxlink.sf.net/ for more info\n"
            "\n"
            "QTH:    Calgary, Alberta\n"
            "QRG:    Repeater link on 147.135+ MHz\n"
            "CTCSS:  CTCSS 110.9 Hz\n"
#           "Trx:    My_transceiver_type\n"
#           "Antenna: My_antenna_brand/type/model\n"
```