

## "Hands-Free" DVAP and Raspberry Pi

Recently I integrated my Raspberry Pi, AA4RC's DVAPTool software and DVAP into a "Portable DVAP Package" that is ready to connect to a reflector or gateway within about 90 seconds of powering up the RPi, all without any intervention from me.

After discussing the process with fellow Papa System members, it became apparent that the easiest way to share this configuration would be to create an SD card that runs AA4RC's DVAPTool at boot. Brain, WA6JFK, and I worked on putting together the following so that you can quickly create your own SD card to integrate your DVAP and Raspberry Pi.



Disclaimer: The authors are not responsible for any data loss, equipment damage or failure and make no claims about the accuracy, completeness, or adequacy of the following procedure. Use at your own risk. Your mileage may vary.

### What You Need

In addition to a Raspberry Pi and DVAP Dongle, you will need an **8GB "Class 10" SD card**. You will be creating an SD card containing Raspbian Wheezy, AA4RC's DVAPTool, a VNC server and the scripts necessary to launch DVAPTool at boot. Remember, **ALL DATA ON THE SD CARD WILL BE WIPED OUT AND REPLACED WITH THE ABOVE!!!** The idea is to create an SD card that has the single purpose of interfacing your DVAP and RPi for use and control with your D-STAR capable radio.

### The Steps

Here are the basic steps:

- Download image
- Unzip image
- Copy image to SD card
- At first boot set frequency, callsign, power...
- Reboot and enjoy

### Download the Image

Download a copy of the SD card image (DVAP-RPI-8gb-3-2-2013.img.gz). Email Brian, WA6JFK at [wa6jfk@me.com](mailto:wa6jfk@me.com) for a link to the image file.

### Unzip the Image

"7-Zip" (available at: <http://www.7-zip.org/>) is a utility you can use to unzip the image file. The zipped image is about 789MB and will expand to about 8 GB. Unzip the image and remember where you saved it.

### Copy Image to SD Card

Use "Win32DiskImager" (available at: <http://sourceforge.net/projects/win32diskimager/>) to copy the image to your SD card. Insert the SD card into your PC, note what drive it has been assigned to, then start "Win32DiskImager". After this program loads, you navigate to the image using the folder icon in the "IMAGE" area and then **Write** to the drive letter that your SD card has taken on your PC. **MAKE SURE YOU ARE WRITING TO THE SD CARD; ALL DATA ON SD CARD WILL BE WIPED OUT!!!!!!**

# "Hands-Free" DVAP and Raspberry Pi

At your first boot you will need to set up DVAPTool with your callsign, frequency, etc. You can boot up with or without a monitor & keyboard... details below.

## **First Boot: With Monitor and Keyboard**

Connect your DVAP, keyboard and mouse (a USB hub may be helpful with this part), monitor and network cable to the RPi and power up. You will see the RPi go thru the boot sequence, eventually ending with the opening of DVAPTool. Click "OK" to clear the message, then click "Close" so you can enter your callsign and frequency. Click "Open" and you should see a DVAP version message. Adjust the other parameters as you wish. Key up to link for a test, then exit for reboot.

## **First Boot: "Headless" (No Monitor or Keyboard)**

To configure your DVAP at first boot without a monitor or keyboard, connect your DVAP and network cable to the RPi and power up. When your DVAP's blue LED starts blinking, VNC to your RPi from your PC (see below). Open "File Manager" (2<sup>nd</sup> toolbar icon from the left). From here, open "DVAPTool" and click "Execute" on the popup window. Enter your callsign and frequency, then click "OPEN" on the DVAP window. Ignore the error window and exit for reboot.



## **Reboot and Enjoy**

Reboot the RPi with your DVAP connected (you no longer need a monitor or keyboard). You will see the green LED slowly pulse on the DVAP; when the DVAP switches to a blinking blue LED, it is ready to accept linking commands over the air. Key up with your link command (REF012AL perhaps) and you will hear, "Remote System Linked". From now on when this SD card is used with your RPi, it will start DVAPTool at boot so all you need to do is use your D-STAR radio to link, talk and unlink.

73!

-Ed, KB6THO

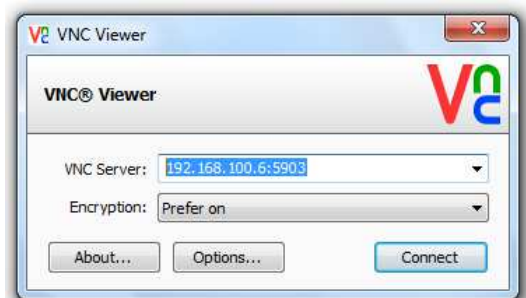
-Brian, WA6JFK

## **Details & Other Stuff**

Here are some of the details for this configuration...

### **TightVNC Server / SSH**

In the future you may want to log on to your RPi to adjust a script, add a WiFi dongle, etc. No worries as this configuration also starts a VNC server on port 5903 at boot (i.e. it is "headless"). To log on to your RPi you will need a VNC viewing client such as RealVNC Viewer (available at: <http://www.realvnc.com/download/viewer/>) and you will need to know the IP of the RPi. The VNC server is reachable at {your RPi's IP}:5903 and the password is **papasys**. Leave username blank. SSH login is also available on port 22: user pi, password raspberry



### **Controlling DVAPTool via VNC**

TightVNC does not access the "local desktop"; it opens "virtual desktops", so you will not see DVAPTool running when you VNC to your RPi as it runs on the local desktop at boot. If you *DO* want to access DVAPTool without a monitor or keyboard (to make adjustments or just to watch), you will need to shut down the boot instance of DVAPTool and restart it in your VNC session. To do that:

- VNC to your RPi (see above).
- Open an LXTerminal window.

## “Hands-Free” DVAP and Raspberry Pi

- Enter “ps -e”. You will see a list of “processes”... look for “DVAPTool” and note the “PID” number.
- Enter “kill -9” followed by the DVAPTool PID. Example: “kill -9 2194” See below for a screen shot of the “ps -e” listing.
- Open “File Manager” (2<sup>nd</sup> toolbar icon from the left).
- From here, open “DVAPTool” and click “Execute” on the popup window.

You can now watch, control and enjoy DVAPTool from this window. When you reboot, DVAPTool will start normally again on the local desktop.

### WiFi with Edimax 7811Un

This SD image is set up to handle WiFi networks and has been tested with the Edimax EW-7811Un USB WiFi dongle. Others may work as well.

To set up, connect a network cable to the Ethernet port on the RPi, plug in your EW-8711Un and boot up. On your PC, VNC to your RPi (see above) and open “Wifi Config”. Under “Manage Networks”, add your WiFi parameters and “Enable” all the networks you want to use. Save your changes. Reboot without the network cable and link up to a reflector to verify your RPi is WiFi-enabled. You can now connect the RPi with a network cable (eth0) and/or the WiFi dongle (wlan0); each interface will have a different IP address.



### “Hidden” SSID

If your network uses a “Hidden SSID”, add “**scan\_ssid=1**” to the “wpa\_supplicant.conf” file. This file is found in the “/etc/wpa\_supplicant” folder.

- VNC into your RPi
- Open an LXTerminal window and enter:  
“sudo nano /etc/wpa\_supplicant/wpa\_supplicant.conf”
- Add “scan\_ssid=1” for the network that uses a hidden SSID.
- “Ctrl-X” and “enter” twice to save your changes.

At next boot you will be connected to the hidden SSID network. Below is an example of the “network” section for a hidden SSID network:

```
network={
    ssid="Secret-Network"
    scan_ssid=1
    psk="supersecretphrase"
    proto=RSN
    key_mgmt=WPA-PSK
    pairwise=CCMP
    auth_alg=OPEN
```

### Files

The following files have been modified or added:

**/etc/inittab:** “1:2345:respawn:/sbin/getty --noclear 38400 tty1” is commented out (insert “#” in front of “1”); replaced with “1:2345:respawn:/bin/login -f pi </dev/tty1 >/dev/tty1 2>&1”. This sets up autologin at boot as user “pi” on tty1.

**/etc/rc.local:** Added “su pi -c startx” to start X Windows at boot (necessary for DVAPTool).

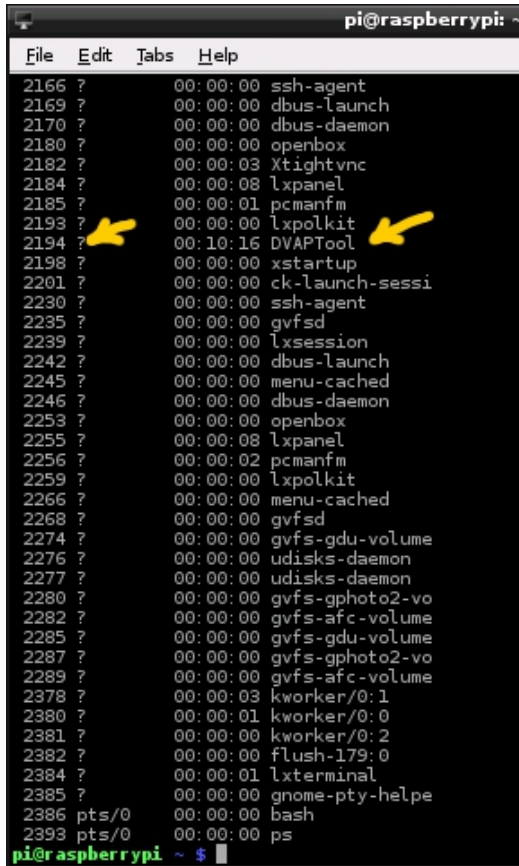
# “Hands-Free” DVAP and Raspberry Pi

**/home/pi/.xinitrc:** Created this executable file to start DVAPTool and open the DVAP with the command “exec /home/pi/DVAPTool –open”.

**/etc/init.d/vnc:** Created this executable file to start the VNC server as user “pi” on port 5903 at boot; installed for boot with “sudo /usr/sbin/update-rc.d vnc defaults”.

## “ps –e” Listing

DVAPTool is process 2194.



```
pi@raspberrypi: ~  
File Edit Tabs Help  
2166 ? 00:00:00 ssh-agent  
2169 ? 00:00:00 dbus-launch  
2170 ? 00:00:00 dbus-daemon  
2180 ? 00:00:00 openbox  
2182 ? 00:00:03 Xtightvnc  
2184 ? 00:00:08 lxpanel  
2185 ? 00:00:01 pcmanfm  
2193 ? 00:00:00 lxpokit  
2194 ? 00:10:16 DVAPTool  
2198 ? 00:00:00 xstartup  
2201 ? 00:00:00 ck-launch-sessi  
2230 ? 00:00:00 ssh-agent  
2235 ? 00:00:00 gvfsd  
2239 ? 00:00:00 lxsession  
2242 ? 00:00:00 dbus-launch  
2245 ? 00:00:00 menu-cached  
2246 ? 00:00:00 dbus-daemon  
2253 ? 00:00:00 openbox  
2255 ? 00:00:08 lxpanel  
2256 ? 00:00:02 pcmanfm  
2259 ? 00:00:00 lxpokit  
2266 ? 00:00:00 menu-cached  
2268 ? 00:00:00 gvfsd  
2274 ? 00:00:00 gvfs-gdu-volume  
2276 ? 00:00:00 udisks-daemon  
2277 ? 00:00:00 udisks-daemon  
2280 ? 00:00:00 gvfs-gphoto2-vo  
2282 ? 00:00:00 gvfs-afc-volume  
2285 ? 00:00:00 gvfs-gdu-volume  
2287 ? 00:00:00 gvfs-gphoto2-vo  
2289 ? 00:00:00 gvfs-afc-volume  
2378 ? 00:00:03 kworker/0:1  
2380 ? 00:00:01 kworker/0:0  
2381 ? 00:00:00 kworker/0:2  
2382 ? 00:00:00 flush-179:0  
2384 ? 00:00:01 lxterminal  
2385 ? 00:00:00 gnome-pty-helpe  
2386 pts/0 00:00:00 bash  
2393 pts/0 00:00:00 ps  
pi@raspberrypi ~ $
```

## Additional Thoughts and Comments

This image was set up with the idea of creating a “Plug and Play” RPi/DVAP configuration that will get you on the air quickly... after configuration at first boot, all you need to do is power it up.

As Amateurs, we naturally tweak and modify our setups to fit our individual needs. For those who wish to travel the path of customization this image should get you started.

If you prefer to manage, control or watch DVAPTool via VNC without shutting down the boot instance, an option is to install “x11vnc” to run at boot instead of “TightVNC”. There are several excellent web resources on how to do this...



## Credits

Thanks to Robin, AA4RC, for porting DVAPTool to RPi, the many Papa System members who are actively developing, experimenting and “pushing the Raspberry Pi Envelope”, as well as the worldwide D-STAR / Raspberry Pi community at large for inspiring us to make the Raspberry Pi/DVAP integration a little easier.

