**VNC (Virtual Network Computing)**

Sometimes it is not convenient to work directly on the Raspberry Pi. Maybe you would like to work on it from another computer by remote control.

VNC is a graphical desktop sharing system that allows you to remotely control the desktop interface of one computer from another. It transmits the keyboard and mouse events from the controller, and receives updates to the screen over the network from the remote host.

You will see the desktop of the Raspberry Pi inside a window on your computer. You'll be able to control it as though you were working on the Raspberry Pi itself.

* On your Pi (using a monitor or via [SSH](https://www.raspberrypi.org/documentation/remote-access/ssh/README.md)), install the TightVNC package:

sudo apt-get install tightvncserver

* Next, run TightVNC Server which will prompt you to enter a password and an optional view-only password:

tightvncserver

* Start a VNC server from the terminal: This example starts a session on VNC display one (:1) with full HD resolution:

vncserver :1 -geometry 1920x1080 -depth 24

Note that since by default an X session is started on display zero, you will get an error in case you use :0.

* Since there are now two X sessions running, which would normally be a waste of resources, it is suggested to stop the displaymanager (cái này là default graphics mode, khi nối dây hdmi vào raspberry pi thì nó xuất ra tín hiện dựa vào cái này, khỏi tắt cũng được) running on :0 using

service lightdm stop

* Now, on your computer, install and run the VNC client:
  + On a Linux machine install the package xtightvncviewer:

sudo apt-get install xtightvncviewer

* + Otherwise, TightVNC is downloadable from [tightvnc.com](http://www.tightvnc.com/download.php)
  + On Windows, connect to raspberry\_pi\_ip\_address:1
  + :1 is displays one

**Automation and run at boot**

You can create a simple file with the command to run the VNC server on the Pi, to save having to remember it:

* Create a file containing the following shell script:
* #!/bin/sh

vncserver :1 -geometry 1920x1080 -depth 24 -dpi 96

* Save this as vnc.sh (for example)
* Make the file executable:

chmod +x vnc.sh

* Then you can run it at any time with:

./vnc.sh

* If you prefer your mouse pointer in the VNC client to appear as an arrow as opposed to an "x" which is default, in /home/pi/.vnc/xstartup add the following parameter to xsetroot:

-cursor\_name left\_ptr

To run at boot:

* Log into a terminal on the Pi as root:

sudo su

* Navigate to the directory /etc/init.d/:

cd /etc/init.d/

* Create a new file here containing the following script:
* #! /bin/sh
* # /etc/init.d/vncboot
* ### BEGIN INIT INFO
* # Provides: vncboot
* # Required-Start: $remote\_fs $syslog
* # Required-Stop: $remote\_fs $syslog
* # Default-Start: 2 3 4 5
* # Default-Stop: 0 1 6
* # Short-Description: Start VNC Server at boot time
* # Description: Start VNC Server at boot time.
* ### END INIT INFO
* USER=pi
* HOME=/home/pi
* export USER HOME
* case "$1" in
* start)
* echo "Starting VNC Server"
* #Insert your favoured settings for a VNC session
* su - $USER -c "/usr/bin/vncserver :1 -geometry 1280x800 -depth 16 -pixelformat rgb565"
* ;;
* stop)
* echo "Stopping VNC Server"
* /usr/bin/vncserver -kill :1
* ;;
* \*)
* echo "Usage: /etc/init.d/vncboot {start|stop}"
* exit 1
* ;;
* esac

exit 0

* Save this file as vncboot (for example)
* Make this file executable:

chmod 755 vncboot

* Enable dependency-based boot sequencing:
* update-rc.d -f lightdm remove

update-rc.d vncboot defaults

* If enabling dependency-based boot sequencing was successful, you will see this:

update-rc.d: using dependency based boot sequencing

* Reboot your Raspberry Pi and you should find a VNC server already started.

You'll now use a VNC **client** program on your PC/laptop to connect to the VNC server and take control of it. Follow instructions for your computer's operating system:

* [Linux](https://www.raspberrypi.org/documentation/remote-access/vnc/linux.md)
* [Mac OS](https://www.raspberrypi.org/documentation/remote-access/vnc/mac.md)
* [Windows](https://www.raspberrypi.org/documentation/remote-access/vnc/windows.md)