**Word Count:1325**

Video, Remote Communication with the Raspberry Pi 4

In this video, we will cover the following topics

* Configure the Raspberry Pi 4 to enable SSH and VNC for remote communication
* Implement and establish remote communication
* Remote file transfer
* Learn to implement remote communication via the internet

In the last video, we showed you how to get the operating system up and running. But let’s say your project’s nature is such that it can’t always be connected to a display, keyboard, and a mouse, then it will be very inconvenient to modify the project. Moreover, wouldn’t it be easier if we could remotely access the Raspbian Desktop environment and interact with it from your laptop or PC.

First, we need to configure the Raspberry Pi for Remote Communication. Then we need to install a VNC Client application on the Raspberry Pi. In computing, Virtual Network Computing is a graphical desktop-sharing system that uses the Remote FrameBuffer protocol to control another computer remotely. First, let's boot up the desktop setup we showcased in the last video.

When you reach the desktop screen, click on the terminal icon on the top left of the taskbar. Every time you boot up your raspberry pi, it's highly recommended to check for updates and upgrade the packages to the latest version. I am now just increasing the font size for better legibility.

Now type in “sudo apt-get update” and press enter. We will learn all about Linux commands later in this course. In a nutshell “apt-update” command will download the package lists from the repositories and "updates" them to get information on the newest versions of packages and their dependencies. It will do this for all repositories. The abbreviation of APT is Advanced Packaging Tool. Now the OS knows what new packages needed to be installed or updated. So shall we install these new packages? It's really simple. Just type in “sudo apt-get upgrade” which will fetch new versions of packages and updates. In both the instructions, we use “sudo” as a prefix. We need to perform both these instructions with superuser capabilities.

Many actions that require modifying system files or installing applications, require extra permissions to go through, which is given by the command “sudo”.

As I am on the latest updated version of Raspbian, no new updates were necessary, as shown here. The next step is to configure the Raspberry Pi to enable remote communication. Type “sudo raspi-config” and press enter. A Raspberry Pi software configuration tool will pop up. Use your keyboard arrow keys to highlight and enter the Interfacing option. Now enable both SSH and VNC. SSH, also known as Secure Shell, is a cryptographic network protocol for operating network services securely over an unsecured network. It doesn’t allow for high data throughput, thus mainly used for Remote command-line interface. We will concentrate on VNC, which allows for graphical remote access to your Pi. Now on the initial menu, select finish.

Next, we will need a VNC Client Software on the Raspberry Pi 4. Thankfully, the Buster OS, comes preloaded with a VNC Client called RealVNC. To start the VNC Server, just open a terminal and type “vncserver”. Now, restart your Raspberry Pi 4 by typing “sudo reboot now” on the terminal. This is to check whether the VNC Server is started automatically on boot. If you see a VNC icon on the left of the bluetooth icon, it means you are successful. Now, left click this icon and keep the IP Address shown here in mind. For some reason, if you are not able to get the IP Address, you can either hover your mouse pointer around the network icon, or type “ifconfig” on the terminal window.

Now on your laptop, we will install the vnc viewer application, through which we will be able to access the GUI of the Raspbian Buster OS. VNC Viewer is supported by all major OSs. We will download and install the windows variant. After installation, make sure that you are connected to the same network as the Raspberry Pi. Then open VNC Viewer and type in the IP address got earlier. Now an authentication window will pop up, where you have to type your Pi’s username and password. As we did not change the default credentials, just type username as “pi” and password as “raspberry”. Check “remember password” and click “ok”. Now you can see the same screen mirrored on to your laptop, and in fact, you can use your laptop touchpad or mouse and keyboard to control the Pi remotely. You can now remove the keyboard and mouse from the pi and interact with the Pi using the laptop's keyboard and touchpad. You can see that there is a slight delay, which is dependent on the quality of your WiFi Connection. Now you can safely remove the monitor also and work with the Pi remotely.

You can send and receive files from your Raspberry Pi and PC using the VNC Viewer. This is really useful to transfer media, codes, and backup files. First, let us learn how to send a file to the Pi. Move your mouse to the top edge of the VNC Viewer Preview, and a menu bar will pop out. In that click, the transfer file icon. Now click “send files” and select the file from your PC. It will be transferred to the buster desktop by default. Now to send a file from the Pi to the PC, first right click on the VNC icon and then select “file transfer”. Now follow the same procedure followed earlier, only this time, the file will be transferred to the PC’s desktop. Note that in both cases, the destination folder can be changed.

There will be times when you would want to access your Pi, when you are not around your house. Till now, we have looked at remote connections within the same network. But in some situations, you would need to access your Pi from anywhere in the world. Fortunately, Real VNC has an inbuilt feature to establish a secure cloud connection with you Pi, via the internet. You have to create a Real VNC Raspberry Pi account on their website, and then log in to the same account in the VNC Connect application and follow the on-screen instructions to finish setting up.

You’re now able to log into your Raspberry Pi’s graphical desktop from anywhere as long as your Raspberry Pi has internet access. You can even access your Pi, from your smartphone. This means you can take control of any security software, check on the status of any projects you’ve set up, or modify your project. If you are still stuck with this setup, please check out the link in the resources section.

If your project, product, or application does not need a GUI to interact with or work on, you can use a simpler method to work with the Pi using a command-line interface remotely. SSH, also known as secure shell is an encrypted technology that enables you to manage devices from a command line over a network. SSH also allows you to share files across network just like VNC. SSH can be very useful, for working with lightweight distros of Raspbian, which doesn’t have a GUI. Moreover, it can be a savior when something crashes, or when your network is so slow for VNC. Please check out the step by step guide in the resources section to use SSH for your Pi.

When working with both VNC & SSH, you will need to know the exact IP address of your Raspberry Pi, to establish remote communication. The IP Address of the Pi is set by the router, and in some cases, the IP Address can change. This is called as a Dynamic IP. This will be very inconvenient, as you would have to scan your Network every time the Pi is booted up. To avoid this you can set a static IP Address for your Raspberry Pi. I have provided a step by step guide in the resources section to setup a Static IP Address. After implementing this, make sure that your Pi’s IP Address has been updated to the new static IP Address, by entering “ifconfig” in the terminal.

Summary

In this video, we have covered the following topics

* Configure the Raspberry Pi 4 to enable SSH and VNC for remote communication
* Implement and establish remote communication
* Remote file transfer
* Learn to implement remote communication via the internet
* Static IP Address

In the next video, we will look at an overview of the features of the Raspbian Buster Operating System.