Automating any of Copper Mountain Technology's VNAs within a Linux environment can be accomplished by using a virtual machine and guestcontrol. This guide is based on Ubuntu 14.04 LTS and VirtualBox 4.3.28, other versions of Linux and VirtualBox should involve a similar procedure.

Creating Virtual Windows in Linux

The following process shows how to create a VirtualBox instance of Windows 7 in Ubuntu, and to establish a connection to the VNA including the USB connection.

1) Install Oracle VM VirtualBox with the Extension Pack on a supported Linux distribution.

2) Create a new virtual machine in VirtualBox. Follow the setup to define the hard-drive and memory space for a Windows Virtual Machine in VirtualBox. Both these parameters may be changed later, if desired. (It is recommended to allocate at least 3GB of RAM for a 64 bit system)

3) Using a CD, DVD, or ISO file, install the Windows operating system in VirtualBox by launching the virtual machine you created in Step 2.

4) After loading the Windows operating system, you will need to configure VirtualBox and Ubuntu to support giving your virtual machines access to USB devices. This involves installation of an additional package (VirtualBox Extension Pack, and gnome-system-tools) and enabling USB for the virtual machine.

5) Finally, to download CMT software online, you will need to connect your virtual machine to the Internet by creating a NAT network; alternatively, you can install the VNA software using a USB drive.

Automating VNAs from within a Windows Virtual Machine in Linux

Once the Virtual Machine is setup, automation in Windows is straightforward. All the same programming examples which are provided with the VNA software installer run out of the box in Virtual Windows, whether the programming is performed in Visual Basic (Excel), MATLAB, or Python.

Automating VNAs from Linux to a Windows Virtual Machine using guestcontrol

In other scenarios, automation from within the Linux environment is desirable. Issuing commands directly to the VNA application from Linux is not practical; since automation commands are issued to CMT VNA software with Microsoft's Component Object Model or COM interface, the Linux operating systems (OS) cannot support sending commands direct to the VNA.

A straightforward alternative approach for automation is to make use of VirtualBox's guestcontrol interface, which allows for issuing commands to the guest OS from the host. Four especially noteworthy guestcontrol commands are 'execute', 'copyto', 'copyfrom', and 'close':

1) *Execute* - remotely launches an executable file in the guest OS, and can be set up to leave control with the guest until the execution completes.

   In the context of VNA automation this command can be used to launch the CMT VNA Windows application in Virtual Windows as well as an executable automation program that only controls the VNA's tasks. With the other VirtualBox guestcontrol commands, execute can be used in a larger automation script to remotely initiate segments of VNA automation, pausing the larger program to wait for results from the VNA automation scripts.
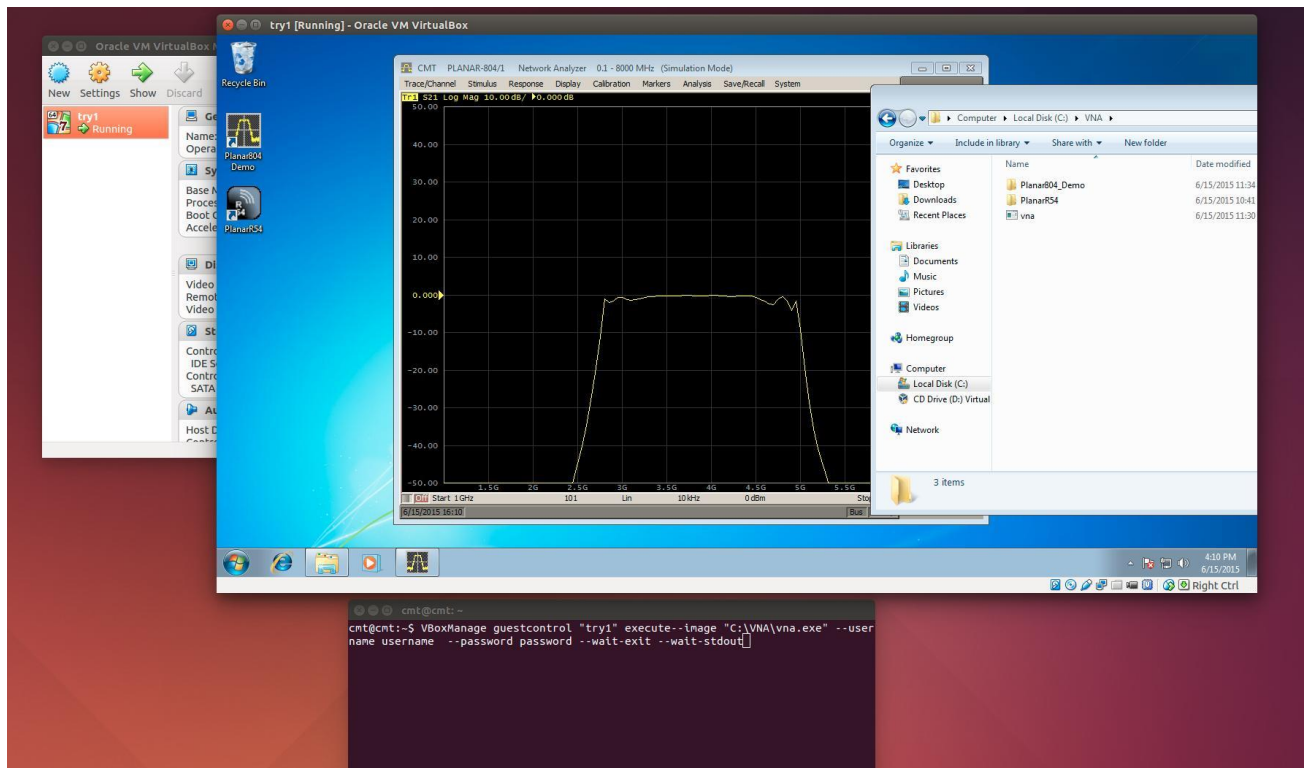
2) *Copyto* - copies one or more files from the host to the guest.

> For VNA automation, 'copyto' can be useful for sending a calibration file or State file to the VNA program.

3) *Copyfrom* - copies one or more files from the guest to the host.

> It can be used to retrieve a saved Touchstone (.S2P) or .CSV test result, for example, or to read a status file generated upon completion of a test.

4) *Close* - removes sessions, or individual commands, from system memory, which is important to implement as the command space memory is finite, and terminated commands are not immediately erased.

Further information

Those interested may find an abundance of walkthrough instructions for each step on the web, from installing and configuring VirtualBox, to loading the virtual operating system, to installing programming environments like MATLAB on Ubuntu.

Feel free to contact us at support@coppermountaintech.com if we can be of any assistance with your VNA automation application in Linux.