

Procedure for Controlling V-Rep from a Virtual Instance of ROS



By:

Riley Kildare

11/4/19

Prepared for :

Professor, H. Sinan Bank

Mechatronic Engineering Dept.

CSU Chico

Change-Log:

Author	Description of change	Date
Riley Kildare	Document Created	11/4/19

1. Objective

The goal of this document is to provide a procedure to establish a connection between V-Rep and a Linux based (ROS) virtual machine, all running within Windows.

//This document provides a procedure to configure a Windows- based host machine and a Linux-based //guest machine to establish a TCP connection between the two.

Estimated setup time: 15 Minutes.

2. Background

While the typical use-case of V-Rep and ROS involves each being installed on a separate machine; for simulation alone, this is unnecessary. For a single machine intended to use ROS for control of V-Rep, it is recommended to install V-Rep directly within ROS.

This document specifically provides a procedure for controlling V-Rep (running on a Windows machine) from ROS running as a virtual machine within VirtualBox (running on the same Windows machine). It is assumed that the machine already has all required software installed and each is operating correctly.

3. Required Software

Bellow is a list of required software

Required Software (Windows)	
Hardware	Notes
VirtualBox	w/ an instance of ROS installed.
V-Rep	
* Python 2.7	Recommended

Note: [This](#) function reference for the V-Rep Python API is useful.

4. Procedure

This section will describe the set-up procedure and can be used as a “quick-start-guide.”

4.1 Configure VirtualBox

1. Open VirtualBox.
2. Select the ROS installation that is to be configured and click “Settings,” shown in figure 4-1 below.

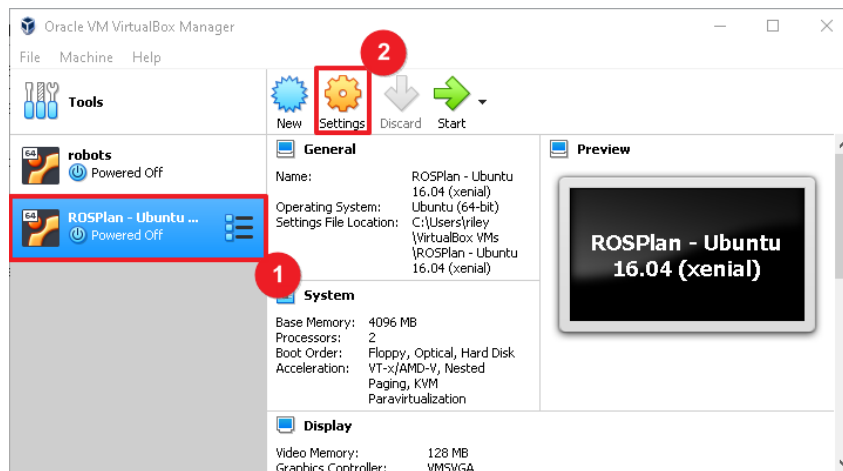


Figure 4-1

3. Within the setting menu:
 - a. Select “Network”
 - b. In the “Adapter 1” tab:
 - i. Change “Attached to:” to “Bridged Adapter” via the dropdown menu.
 - ii. Change “Name:” to the name of a network adapter connected to be machine via the dropdown menu and click “OK”. It is recommended to use a wireless adapter. An example is shown below in figure 4-2.

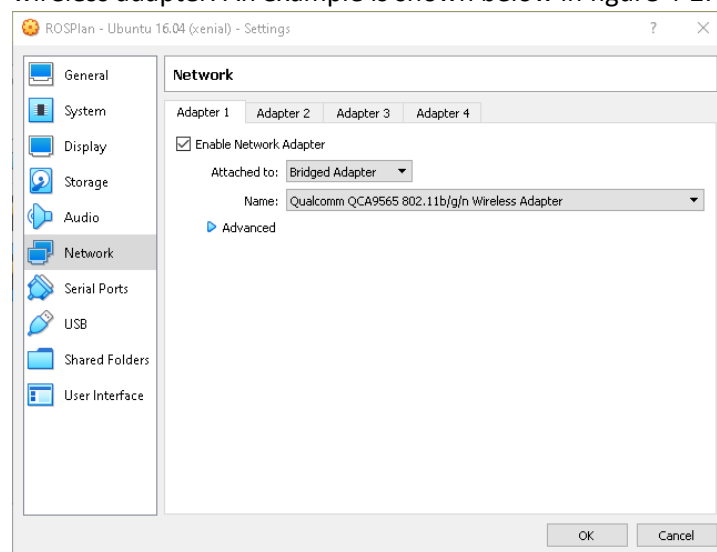


Figure 4-2

4.2 Configure V-REP

1. Open a project on V-Rep.
2. Right-click any object within the “Scene Hierarchy,” and hover over “Add” then “Associated Child Script” as shown in figure 4-3.

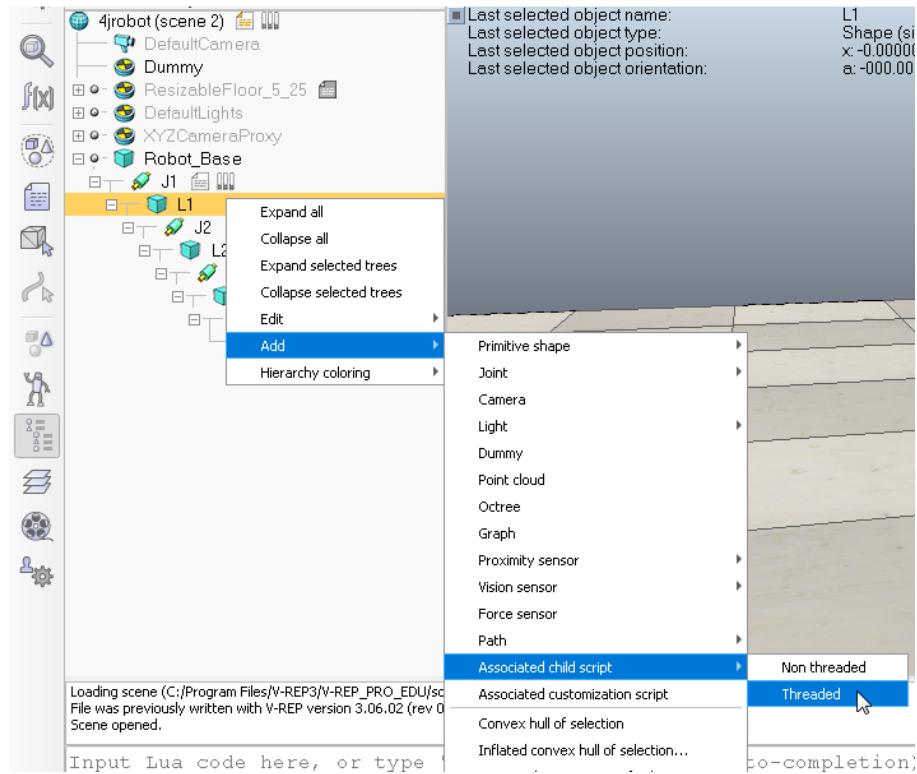


Figure 4-3

3. Copy and paste the following into the script:

```
function sysCall_init()
simRemoteApi.start(19999)
end
```

Note: This script will open and listen to port 19999 when the simulation is started.

4. Close the script editor window. V-Rep is now configured within the context of this guide.

4.3 Configure ROS

1. Start the ROS virtual machine, configured in section 4.1, from VirtualBox by clicking the “Start” button as shown in figure 4-4. Once the ROS starts, log in.

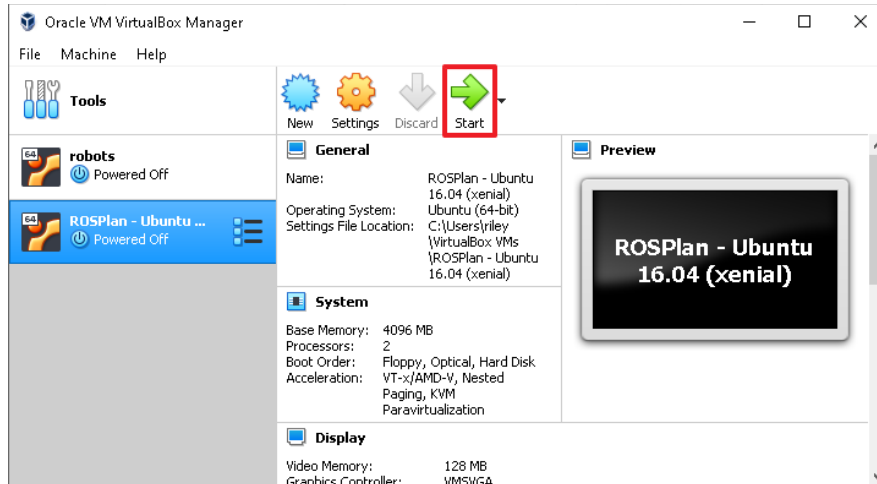


Figure 4-4

2. Right-Click on the desktop and create a folder and open it. For this example, this folder will be called “vrepj.”
3. In Windows, navigate to:

C:\Program Files\V-REP3\V-REP_PRO_EDU\programming\remoteApiBindings\python\python

Note: Modify the path above as necessary if V-Rep is installed in a different location.

4. Highlight the contents of this folder and drag them to the open “vrepj” folder within ROS.

5. In Windows, navigate to:

C:\Program Files\V-REP3\V-REP_PRO_EDU\programming\remoteApiBindings\lib\lib\Linux\64Bit

6. Drag the “remoteApi.so” file into the “vrepj” folder within ROS. ROS is now configured.

To be able to drag and drop, use inside ROS on top menu > Devices > Insert guest additions CD image.

After doing that, Run it!

Then open the Terminal and type: "reboot"

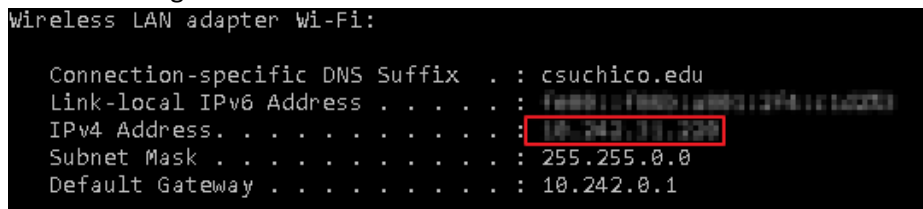
You can now drag and drop, copy and paste from ROS to Windows and vice-ver-sa

5. Validating Functionality

This Section will provide a method to validate that V-Rep and ROS are communicating properly and will assume that all steps within section 4 have been performed.

5.1 Setup

1. Open the command prompt within Windows.
 - a. Press win+R
 - b. Type "cmd" then press enter.
2. Type "ipconfig" and press enter.
3. Navigate to the network adapter selected in section 4.1.3 and take note of the IPv4 address, as shown in figure 5-1.



```
Wireless LAN adapter Wi-Fi:

Connection-specific DNS Suffix  . : csuchico.edu
Link-local IPv6 Address . . . . . : fe80::f6b0:12b0:12b0:12b0
IPv4 Address. . . . . : 10.242.0.1
Subnet Mask . . . . . : 255.255.0.0
Default Gateway . . . . . : 10.242.0.1
```

Figure 5-1

4. Within ROS, open 'gedit' and create a new document.
 - a. Copy and paste the following into the new document, where Your_IP_Address is the IP address from step 5.1.3:

```
try:
    import vrep
except:
    print('error... could not import vrep.py')
    print('Make sure vrep.py is located in the same folder as this')
vrep.simxFinish(-1)
clientID=vrep.simxStart('Your_IP_Address',19999,True,True,5000,5)
if clientID!=-1:
    print ('Pass')
    vrep.simxAddStatusbarMessage(clientID,'Pass',vrep.simx_opmode_oneshot)
    vrep.simxGetPingTime(clientID)
    vrep.simxFinish(clientID)
else:
    print ('Fail')
```

Instead of this code below, use the "VSCode_Controller" code (copy and paste it into "test.py", which is found in "vrep.py" folder)

- b. Save the document as a '.py' file to the 'vrep.py' folder created in step 4.3.2.
 - i. For the purposes of this document, this file will be referred to as 'test.py'

5.2 Procedure

1. Within V-Rep Begin the simulation by clicking the play button.

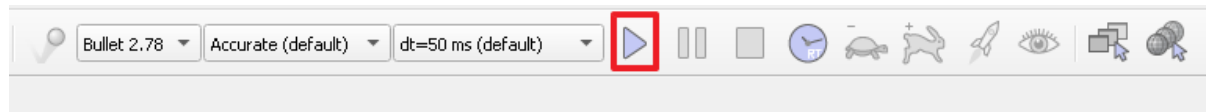


Figure 5-2

2. Within ROS, open the terminal and type the following commands. (Assuming the file-structure of this document was followed.)

a. `cd Desktop/vrepy`

b. `python test.py`

5.3 Interpretation of Results

If all is configured correctly, the message “Pass” will be displayed in both the Linux terminal within ROS as well as the terminal within V-Rep; examples of these are shown below in figure 5-3 and 5-4 respectively.

```
rosplan@rosplan-xenial: ~/Desktop/vrepy
rosplan@rosplan-xenial:~$ cd Desktop/vrepy
rosplan@rosplan-xenial:~/Desktop/vrepy$ python test.py
Pass
rosplan@rosplan-xenial:~/Desktop/vrepy$
```

Figure 5-3

```
Simulator launched, welcome!
(for quick customizations, edit the sandbox script system/sandboxscript.txt)
Default scene was set-up.
Loading scene (C:/Program Files/V-REP3/V-REP_PRO_EDU/scenes/4jrobot.ttt). Serialization version is 22.
File was previously written with V-REP version 3.06.02 (rev 0) (V-REP PRO EDU license)
Scene opened.
Simulation started.
Pass

Input Lua code here, or type "help()" (use TAB for auto-completion)
```

Figure 5-4