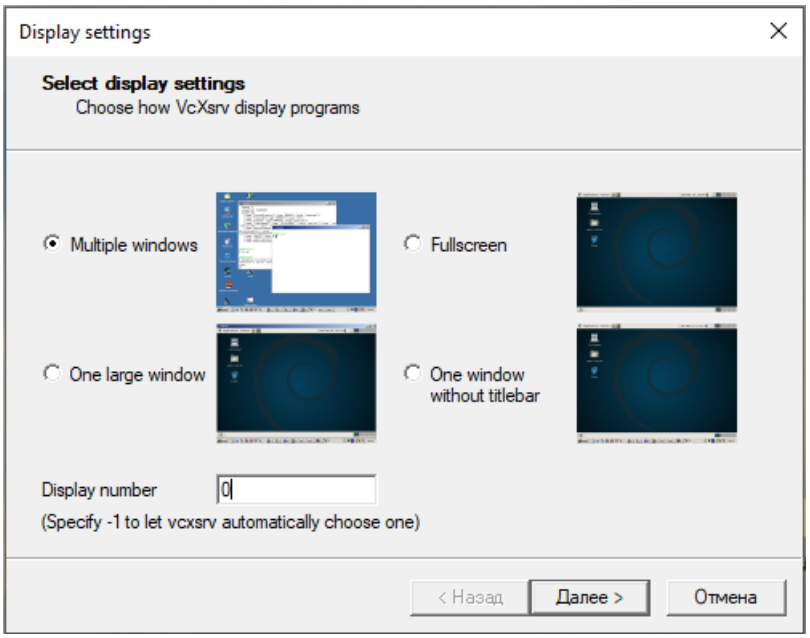
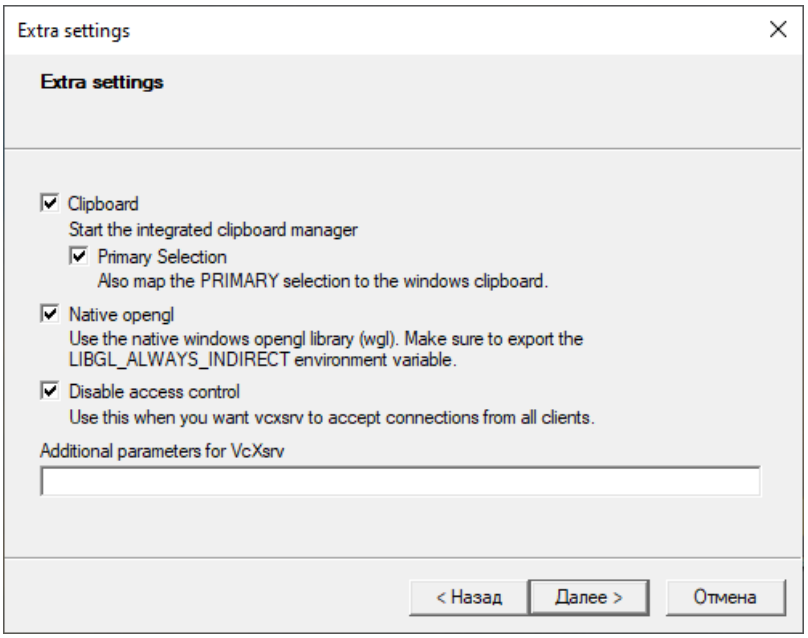
1) Install Windows 10 Update 21H2. If it does not work through the update center, then follow the instructions https://www.comss.ru/page.php?id=9317
2) Enable Intel Virtualization Technology in Bios: **Advanced > CPU Configuration > Intel Virtualization Technology**
3) Install wslv2 https://docs.microsoft.com/ru-ru/windows/wsl/install
   run these commands in Microsoft PowerShell, it should install version 20.04 by default:
   wsl --install -d -ubuntu
   wsl --set-version ubuntu 2
4) Open ubuntu and update available packages:
   sudo apt-get update
   sudo apt-get dist-upgrade
5) Install ROS http://wiki.ros.org/Installation/Ubuntu
   In 1.4 Installation choose “Desktop Install”, to then manually select the version of gazebo
6) Before installing Gazebo, you need to install VcXrvc for GUI output
   https://sourceforge.net/projects/vcxsrv/
   Set Display number to 0



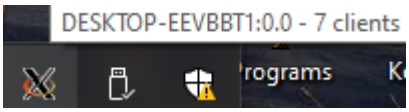
In the last window, put "Disable access control"

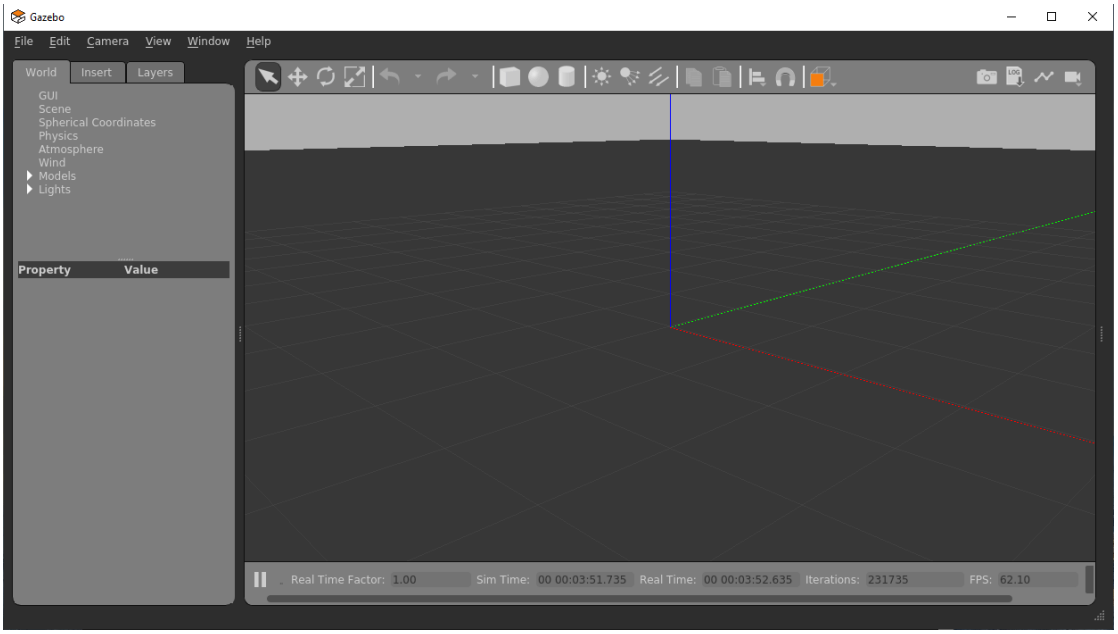


7) Install Gazebo https://classic.gazebosim.org/tutorials?tut=install_ubuntu&cat=install
Before starting Gazebo, you need to change the display output. To do this, enter your IP address.
Start > Settings > Network & Internet > Ethernet > your network connection > IPv4

export DISPLAY=<Your IPv4 Address>:0.0
export GAZEBO_IP=127.0.0.1
export LIBGL_ALWAYS_INDIRECT=0

After that, start Gazebo, a connection to the server will appear and the Gazebo window will open



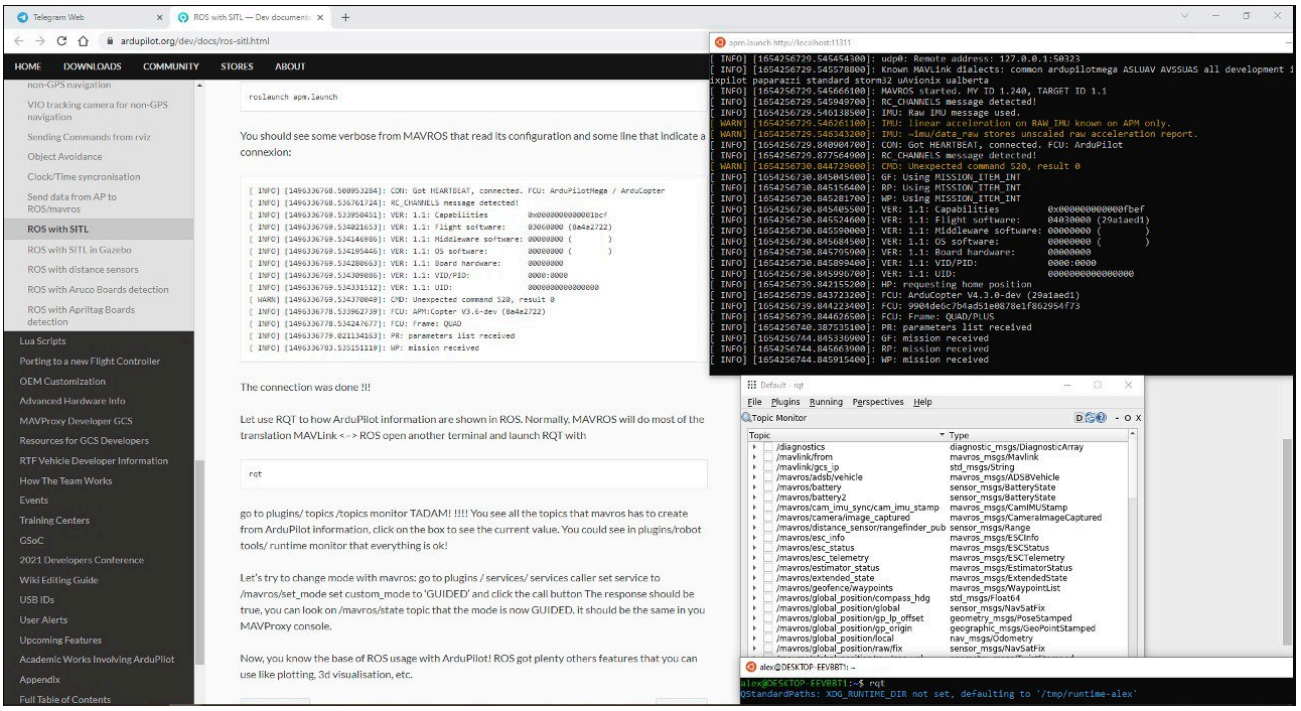


If it doesn't, try

gazebo --verbose

If there are no errors and everything is green, but there is no connection to the server, then double-check the IP address

8) Then you can install gazebo_ros, choose ros noetic.
https://classic.gazebosim.org/tutorials?tut=ros_installing&cat=connect_ros
should run without problems:
roscore & rosrun gazebo_ros gazebo
9) Install MAVROS
https://ardupilot.org/dev/docs/ros-install.html#installing-mavros
10) Copy and install via github ArduPilot
https://ardupilot.org/dev/docs/building-setup-linux.html#building-setup-linux
11) You will also need to execute the file to install the library
./install_geographiclib_datasets.sh
12) In the end, it will be possible to connect Ardupilot to ROS
https://ardupilot.org/dev/docs/ros-sitl.html


Telegram Web
ROS with SITL — Dev documenta
ardupilot.org/dev/docs/ros-sitl.html
HOME
DOWNLOADS
COMMUNITY
STORES
ABOUT
non-GPS navigation
VIO tracking camera for non-GPS navigation
Sending Commands from rviz
Object Avoidance
Clock/Time syncronisation
Send data from AP to ROS/mavros
ROS with SITL
ROS with SITL in Gazebo
ROS with distance sensors
ROS with Aruco Boards detection
ROS with Apriltag Boards detection
Lua Scripts
Porting to a new Flight Controller
OEM Customization
Advanced Hardware Info
MAVProxy Developer GCS
Resources for GCS Developers
RTF Vehicle Developer Information
How The Team Works
Events
Training Centers
GSoC
2021 Developers Conference
Wiki Editing Guide
USB IDs
User Alerts
Upcoming Features
Academic Works Involving ArduPilot
Appendix
Full Table of Contents
roslaunch apm.launch
You should see some verbose from MAVROS that read its configuration and some line that indicate a connexion:
[INFO] [1496336768.580953284]: CON: Got HEARTBEAT, connected. FCU: ArduPilotMega / ArduCopter
[INFO] [1496336768.536761724]: RC_CHANNELS message detected!
[INFO] [1496336769.533950451]: VER: 1.1: Capabilities 0x00000000000001bcf
[INFO] [1496336769.534021653]: VER: 1.1: Flight software: 03060000 (8e4e2722)
[INFO] [1496336769.534146986]: VER: 1.1: Middleware software: 00000000 ( )
[INFO] [1496336769.534195446]: VER: 1.1: OS software: 00000000 ( )
[INFO] [1496336769.534280663]: VER: 1.1: Board hardware: 00000000
[INFO] [1496336769.534309086]: VER: 1.1: VID/PID: 0000:0000
[INFO] [1496336769.534331312]: VER: 1.1: UID: 0000000000000000
[WARN] [1496336769.534370049]: CMD: Unexpected command 520, result 0
[INFO] [1496336778.533962739]: FCU: APM:Copter V3.6-dev (8e4e2722)
[INFO] [1496336778.534247677]: FCU: frame: QUAD
[INFO] [1496336779.021134163]: PR: parameters list received
[INFO] [1496336783.535151119]: WP: mission received
The connection was done !!!
Let use RQT to how ArduPilot information are shown in ROS. Normally, MAVROS will do most of the translation MAVLink <-> ROS open another terminal and launch RQT with
rqt
go to plugins/ topics /topics monitor TADAM! !!!! You see all the topics that mavros has to create from ArduPilot information, click on the box to see the current value. You could see in plugins/robot tools/ runtime monitor that everything is ok!
Let's try to change mode with mavros: go to plugins / services/ services caller set service to /mavros/set_mode set custom_mode to 'GUIDED' and click the call button The response should be true, you can look on /mavros/state topic that the mode is now GUIDED, it should be the same in you MAVProxy console.
Now, you know the base of ROS usage with ArduPilot! ROS got plenty others features that you can use like plotting, 3d visualisation, etc.
apm.launch http://localhost:11311
[INFO] [1654256729.545454300]: udp0: Remote address: 127.0.0.1:50323
[INFO] [1654256729.545578800]: Known MAVLink dialects: common ardupilotmega ASLUAV AVSSUAS all development
ixpilot paparazzi standard storm32 uAvionix ualberta
[INFO] [1654256729.545666100]: MAVROS started. MY ID 1.240, TARGET ID 1.1
[INFO] [1654256729.545940700]: RC_CHANNELS message detected!
[INFO] [1654256729.546138500]: IMU: Raw IMU message used.
[WARN] [1654256729.546261100]: IMU: linear acceleration on RAW_IMU known on APM only.
[WARN] [1654256729.546343200]: IMU: ~imu/data_raw stores unscaled raw acceleration report.
[INFO] [1654256729.840904700]: CON: Got HEARTBEAT, connected. FCU: ArduPilot
[INFO] [1654256729.877564900]: RC_CHANNELS message detected!
[WARN] [1654256730.844729600]: CMD: Unexpected command 520, result 0
[INFO] [1654256730.845045400]: GF: Using MISSION_ITEM_INT
[INFO] [1654256730.845156400]: RP: Using MISSION_ITEM_INT
[INFO] [1654256730.845281700]: WP: Using MISSION_ITEM_INT
[INFO] [1654256730.845405500]: VER: 1.1: Capabilities 0x00000000000fbef
[INFO] [1654256730.845524600]: VER: 1.1: Flight software: 04030000 (29a1aed1)
[INFO] [1654256730.845590000]: VER: 1.1: Middleware software: 00000000 ( )
[INFO] [1654256730.845684500]: VER: 1.1: OS software: 00000000 ( )
[INFO] [1654256730.845795900]: VER: 1.1: Board hardware: 00000000
[INFO] [1654256730.845899400]: VER: 1.1: VID/PID: 0000:0000
[INFO] [1654256730.845995700]: VER: 1.1: UID: 0000000000000000
[INFO] [1654256730.842155200]: HP: requesting home position
[INFO] [1654256739.843723200]: FCU: ArduCopter V4.3.0-dev (29a1aed1)
[INFO] [1654256739.844223400]: FCU: 9904de6c7b4ad51e0878e1f862954f73
[INFO] [1654256739.844628500]: FCU: Frame: QUAD/PLUS
[INFO] [1654256740.387535100]: PR: parameters list received
[INFO] [1654256744.845336900]: GF: mission received
[INFO] [1654256744.845663000]: RP: mission received
[INFO] [1654256744.845915400]: WP: mission received
Default - rqt
File Plugins Running Perspectives Help
Topic Monitor
Topic
Type
/diagnostics diagnostic_msgs/DiagnosticArray
/mavlink/from mavros_msgs/Mavlink
/mavlink/gcs_ip std_msgs/String
/mavros/adsb/vehicle mavros_msgs/ADSBVehicle
/mavros/battery sensor_msgs/BatteryState
/mavros/battery2 sensor_msgs/BatteryState
/mavros/cam_imu_sync/cam_imu_stamp mavros_msgs/CamIMUStamp
/mavros/camera/image_captured mavros_msgs/CameraImageCaptured
/mavros/distance_sensor/rangefinder_pub sensor_msgs/Range
/mavros/esc_info mavros_msgs/ESCInfo
/mavros/esc_status mavros_msgs/ESCStatus
/mavros/esc_telemetry mavros_msgs/ESCTelemetry
/mavros/estimator_status mavros_msgs/EstimatorStatus
/mavros/extended_state mavros_msgs/ExtendedState
/mavros/geofence/waypoints mavros_msgs/WaypointList
/mavros/global_position/compass_hdg std_msgs/Float64
/mavros/global_position/global sensor_msgs/NavSatFix
/mavros/global_position/gp_lp_offset geometry_msgs/PoseStamped
/mavros/global_position/gp_origin geographic_msgs/GeoPointStamped
/mavros/global_position/local nav_msgs/Odometry
/mavros/global_position/raw/fix sensor_msgs/NavSatFix
alex@DESKTOP-FEVBBT1:~
alex@DESKTOP-FEVBBT1:~$ rqt
QStandardPaths: XDG_RUNTIME_DIR not set, defaulting to '/tmp/runtime-alex'