

# Installing ROS Noetic on Ubuntu 20.04

In this Tutorial I will explain and show steps of install noetic ROS on Ubuntu 20.04 and I will put all codes with figures to show the code working correctly without any errors, this Tutorial will be in English and Arabic languages.

After installing Ubuntu 20.04 on Virtual machine (Oracle VM VirtualBox Manager) I open terminal (search for Terminal from application or press Ctrl+Alt+T in same time).

سأقوم بشرح خطوات تحميل ROS noetic على نظام Ubuntu نسخة رقم 20.04 وراح اكتب الاكواد هنا بالإضافة الى وضع صور للخطوات لتأكد انا الكود خالي من اي اخطاء اثناء التنفيذ.

بعد تحميل نظام Ubuntu على Virtual machine وتشغيل النظام نقوم بفتح نافذة الاوامر المعروفة بإسم terminal من خلال الضغط على ايقونة التطبيقات وكتابة terminal في البحث او بطريقة اخرى من خلال الضغط على زر Ctrl+Alt+T في الوقت نفسه.

## Configure:

First, I Configure Ubuntu repositories to allow "restricted," "universe," and "multiverse." From Ubuntu software tab ([Source](#)).

في هذه الخطوة سنقوم بتهيئة النظام الى repositories لیسمح ل "restricted," "universe," and "multiverse" من خلال Ubuntu software tab. يمكنك الإطلاع على رابط المرفق في الأعلى لمعرفة كيفية عملها بشكل أوضح ([المصدر](#)).

## Setup sources.list:

Then I write this code to setup my computer to accept software from package.ros.org

الكود التالي سيسمح لجهازنا بتنصيب البرمجيات من package.ros.org .

```
sudo sh -c 'echo "deb http://packages.ros.org/ros/ubuntu $(lsb_release -sc) main" > /etc/apt/sources.list.d/ros-latest.list'
```

```
wrwr@wrwr-VirtualBox:~$ sudo sh -c 'echo "deb http://packages.ros.org/ros/ubuntu $(lsb_release -sc) main" > /etc/apt/sources.list.d/ros-latest.list'
```

after writing the code just press Enter to run it.

بعد كتابتنا للكود سنقوم بالضغط على مفتاح Enter من لوحة المفاتيح Keyboard

## Set up Keys:

after that I set up the keys:

بعد ذلك قمت بكتابة الكود التالي في نافذة الاوامر

```
sudo apt-key adv --keyserver 'hkp://keyserver.ubuntu.com:80' --recv-key C1CF6E31E6BADE8868B172B4F42ED6FBAB17C654
```

```
wrwr@wrwr-VirtualBox:~$ sudo apt-key adv --keyserver 'hkp://keyserver.ubuntu.com:80' --recv-key C1CF6E31E6BADE8868B172B4F42ED6FBAB17C654
Executing: /tmp/apt-key-gpghome.kGDwbdC0SI/gpg.1.sh --keyserver hkp://keyserver.ubuntu.com:80 --recv-key C1CF6E31E6BADE8868B172B4F42ED6FBAB17C654
gpg: key F42ED6FBAB17C654: public key "Open Robotics <info@osrfoundation.org>" imported
gpg: Total number processed: 1
gpg:         imported: 1
```

## Installation:

First step, I will check if my Debian packages is up to date:

قبل القيام في عملية التنصيب سأقوم بالتحقق من حزم Debian لتأكد من انها اخر تحديث.

```
sudo apt update
```

```
wrwr@wrwr-VirtualBox:~$ sudo apt update
Hit:1 http://sa.archive.ubuntu.com/ubuntu focal InRelease
Get:2 http://sa.archive.ubuntu.com/ubuntu focal-updates InRelease [107 kB]
Get:3 http://security.ubuntu.com/ubuntu focal-security InRelease [107 kB]
Get:4 http://sa.archive.ubuntu.com/ubuntu focal-backports InRelease [98.3 kB]
Get:5 http://packages.ros.org/ros/ubuntu focal InRelease [4650 B]
Get:6 http://packages.ros.org/ros/ubuntu focal/main i386 Packages [15.1 kB]
Get:7 http://packages.ros.org/ros/ubuntu focal/main amd64 Packages [199 kB]
Fetched 531 kB in 6s (87.7 kB/s)
Reading package lists... Done
Building dependency tree
Reading state information... Done
29 packages can be upgraded. Run 'apt list --upgradable' to see them.
```

Next step I will install Desktop-Full by writing this code in terminal.

الخطوة التالية هي عملية التنصيب وهنا قمت بإختيار نسخة ال Desktop-Full .

```
sudo apt install ros-noetic-desktop-full
```

```

w@wdrwrv-VirtualBox:~$ sudo apt install ros-noetic-desktop
Reading package lists... Done
Building dependency tree
Reading state information... Done
The following additional packages will be installed:
  autoconf automake autotools-dev binfmt-support blt bzip2-doc cmake cmake-data cpp-8 curl default-libmysqlclient-dev docutils-common fonts-ly
  gfortran-9 google-mock googletest graphviz hddcemp libverbs-providers icu-devtools javascript-common libaec0 libann0 libapri1 libar1p1 libar1p2 liba
  libassimp-dev libassimp5 libassuan-dev libavcodec-dev libavformat-dev libavresample-dev libavresample4 libavutil-dev libblas3 libboost-all-
  libboost-atomic1.71.0 libboost-chrono-dev libboost-chrono1.71.0 libboost-chrono1.71.0 libboost-container-dev libboost-container1.71.0 lib
  libboost-context1.71.0 libboost-context1.71.0 libboost-coroutine-dev libboost-coroutine1.71.0 libboost-coroutine1.71.0 libboost-date-tim
  libboost-exception-dev libboost-exception1.71.0 libboost-fiber-dev libboost-fiber1.71.0 libboost-fiber1.71.0 libboost-filesystem-dev lib
  libboost-graph-parallel-dev libboost-graph-parallel1.71.0 libboost-graph-parallel1.71.0 libboost-graph1.71.0 libboost-graph1.71.0 libboos
  libboost-locale-dev libboost-locale1.71.0 libboost-log-dev libboost-log1.71.0 libboost-log1.71.0 libboost-math-dev libboost-math1.71.0 dev
  libboost-mpi-python-dev libboost-mpi-python1.71.0 libboost-mpi-python1.71.0 libboost-mpi1.71.0 libboost-mpi1.71.0 libboost-numpy-dev lib
  libboost-program-options-dev libboost-program-options1.71.0 libboost-program-options1.71.0 libboost-python-dev libboost-python1.71.0 lib
  libboost-random1.71.0 libboost-random1.71.0 libboost-regex-dev libboost-regex1.71.0 libboost-regex1.71.0 libboost-serialization-dev lib
  libboost-stacktrace-dev libboost-stacktrace1.71.0 libboost-stacktrace1.71.0 libboost-system-dev libboost-system1.71.0 libboost-system1.71.0
  libboost-test1.71.0 libboost-thread-dev libboost-thread1.71.0 libboost-timer-dev libboost-timer1.71.0 libboost-timer1.71.0 libboost-tool
  libboost-type-erasure1.71.0 libboost-type-erasure1.71.0 libboost-wave-dev libboost-wave1.71.0 libboost-wave1.71.0 libboost1.71.0 libboost1.71.0
  libbtf1 libbtf2 libbtf3 libbtf4 libbtf5 libbtf6 libbtf7 libbtf8 libbtf9 libbtf10 libbtf11 libbtf12 libbtf13 libbtf14 libbtf15 libbtf16 libbtf17 libbtf18 libbtf19 libbtf20 libbtf21 libbtf22 libbtf23 libbtf24 libbtf25 libbtf26 libbtf27 libbtf28 libbtf29 libbtf30 libbtf31 libbtf32 libbtf33 libbtf34 libbtf35 libbtf36 libbtf37 libbtf38 libbtf39 libbtf40 libbtf41 libbtf42 libbtf43 libbtf44 libbtf45 libbtf46 libbtf47 libbtf48 libbtf49 libbtf50 libbtf51 libbtf52 libbtf53 libbtf54 libbtf55 libbtf56 libbtf57 libbtf58 libbtf59 libbtf60 libbtf61 libbtf62 libbtf63 libbtf64 libbtf65 libbtf66 libbtf67 libbtf68 libbtf69 libbtf70 libbtf71 libbtf72 libbtf73 libbtf74 libbtf75 libbtf76 libbtf77 libbtf78 libbtf79 libbtf80 libbtf81 libbtf82 libbtf83 libbtf84 libbtf85 libbtf86 libbtf87 libbtf88 libbtf89 libbtf90 libbtf91 libbtf92 libbtf93 libbtf94 libbtf95 libbtf96 libbtf97 libbtf98 libbtf99 libbtf100 libbtf101 libbtf102 libbtf103 libbtf104 libbtf105 libbtf106 libbtf107 libbtf108 libbtf109 libbtf110 libbtf111 libbtf112 libbtf113 libbtf114 libbtf115 libbtf116 libbtf117 libbtf118 libbtf119 libbtf120 libbtf121 libbtf122 libbtf123 libbtf124 libbtf125 libbtf126 libbtf127 libbtf128 libbtf129 libbtf130 libbtf131 libbtf132 libbtf133 libbtf134 libbtf135 libbtf136 libbtf137 libbtf138 libbtf139 libbtf140 libbtf141 libbtf142 libbtf143 libbtf144 libbtf145 libbtf146 libbtf147 libbtf148 libbtf149 libbtf150 libbtf151 libbtf152 libbtf153 libbtf154 libbtf155 libbtf156 libbtf157 libbtf158 libbtf159 libbtf160 libbtf161 libbtf162 libbtf163 libbtf164 libbtf165 libbtf166 libbtf167 libbtf168 libbtf169 libbtf170 libbtf171 libbtf172 libbtf173 libbtf174 libbtf175 libbtf176 libbtf177 libbtf178 libbtf179 libbtf180 libbtf181 libbtf182 libbtf183 libbtf184 libbtf185 libbtf186 libbtf187 libbtf188 libbtf189 libbtf190 libbtf191 libbtf192 libbtf193 libbtf194 libbtf195 libbtf196 libbtf197 libbtf198 libbtf199 libbtf200 libbtf201 libbtf202 libbtf203 libbtf204 libbtf205 libbtf206 libbtf207 libbtf208 libbtf209 libbtf210 libbtf211 libbtf212 libbtf213 libbtf214 libbtf215 libbtf216 libbtf217 libbtf218 libbtf219 libbtf220 libbtf221 libbtf222 libbtf223 libbtf224 libbtf225 libbtf226 libbtf227 libbtf228 libbtf229 libbtf230 libbtf231 libbtf232 libbtf233 libbtf234 libbtf235 libbtf236 libbtf237 libbtf238 libbtf239 libbtf240 libbtf241 libbtf242 libbtf243 libbtf244 libbtf245 libbtf246 libbtf247 libbtf248 libbtf249 libbtf250 libbtf251 libbtf252 libbtf253 libbtf254 libbtf255 libbtf256 libbtf257 libbtf258 libbtf259 libbtf260 libbtf261 libbtf262 libbtf263 libbtf264 libbtf265 libbtf266 libbtf267 libbtf268 libbtf269 libbtf270 libbtf271 libbtf272 libbtf273 libbtf274 libbtf275 libbtf276 libbtf277 libbtf278 libbtf279 libbtf280 libbtf281 libbtf282 libbtf283 libbtf284 libbtf285 libbtf286 libbtf287 libbtf288 libbtf289 libbtf290 libbtf291 libbtf292 libbtf293 libbtf294 libbtf295 libbtf296 libbtf297 libbtf298 libbtf299 libbtf300 libbtf301 libbtf302 libbtf303 libbtf304 libbtf305 libbtf306 libbtf307 libbtf308 libbtf309 libbtf310 libbtf311 libbtf312 libbtf313 libbtf314 libbtf315 libbtf316 libbtf317 libbtf318 libbtf319 libbtf320 libbtf321 libbtf322 libbtf323 libbtf324 libbtf325 libbtf326 libbtf327 libbtf328 libbtf329 libbtf330 libbtf331 libbtf332 libbtf333 libbtf334 libbtf335 libbtf336 libbtf337 libbtf338 libbtf339 libbtf340 libbtf341 libbtf342 libbtf343 libbtf344 libbtf345 libbtf346 libbtf347 libbtf348 libbtf349 libbtf350 libbtf351 libbtf352 libbtf353 libbtf354 libbtf355 libbtf356 libbtf357 libbtf358 libbtf359 libbtf360 libbtf361 libbtf362 libbtf363 libbtf364 libbtf365 libbtf366 libbtf367 libbtf368 libbtf369 libbtf370 libbtf371 libbtf372 libbtf373 libbtf374 libbtf375 libbtf376 libbtf377 libbtf378 libbtf379 libbtf380 libbtf381 libbtf382 libbtf383 libbtf384 libbtf385 libbtf386 libbtf387 libbtf388 libbtf389 libbtf390 libbtf391 libbtf392 libbtf393 libbtf394 libbtf395 libbtf396 libbtf397 libbtf398 libbtf399 libbtf400 libbtf401 libbtf402 libbtf403 libbtf404 libbtf405 libbtf406 libbtf407 libbtf408 libbtf409 libbtf410 libbtf411 libbtf412 libbtf413 libbtf414 libbtf415 libbtf416 libbtf417 libbtf418 libbtf419 libbtf420 libbtf421 libbtf422 libbtf423 libbtf424 libbtf425 libbtf426 libbtf427 libbtf428 libbtf429 libbtf430 libbtf431 libbtf432 libbtf433 libbtf434 libbtf435 libbtf436 libbtf437 libbtf438 libbtf439 libbtf440 libbtf441 libbtf442 libbtf443 libbtf444 libbtf445 libbtf446 libbtf447 libbtf448 libbtf449 libbtf450 libbtf451 libbtf452 libbtf453 libbtf454 libbtf455 libbtf456 libbtf457 libbtf458 libbtf459 libbtf460 libbtf461 libbtf462 libbtf463 libbtf464 libbtf465 libbtf466 libbtf467 libbtf468 libbtf469 libbtf470 libbtf471 libbtf472 libbtf473 libbtf474 libbtf475 libbtf476 libbtf477 libbtf478 libbtf479 libbtf480 libbtf481 libbtf482 libbtf483 libbtf484 libbtf485 libbtf486 libbtf487 libbtf488 libbtf489 libbtf490 libbtf491 libbtf492 libbtf493 libbtf494 libbtf495 libbtf496 libbtf497 libbtf498 libbtf499 libbtf500 libbtf501 libbtf502 libbtf503 libbtf504 libbtf505 libbtf506 libbtf507 libbtf508 libbtf509 libbtf510 libbtf511 libbtf512 libbtf513 libbtf514 libbtf515 libbtf516 libbtf517 libbtf518 libbtf519 libbtf520 libbtf521 libbtf522 libbtf523 libbtf524 libbtf525 libbtf526 libbtf527 libbtf528 libbtf529 libbtf530 libbtf531 libbtf532 libbtf533 libbtf534 libbtf535 libbtf536 libbtf537 libbtf538 libbtf539 libbtf540 libbtf541 libbtf542 libbtf543 libbtf544 libbtf545 libbtf546 libbtf547 libbtf548 libbtf549 libbtf550 libbtf551 libbtf552 libbtf553 libbtf554 libbtf555 libbtf556 libbtf557 libbtf558 libbtf559 libbtf560 libbtf561 libbtf562 libbtf563 libbtf564 libbtf565 libbtf566 libbtf567 libbtf568 libbtf569 libbtf570 libbtf571 libbtf572 libbtf573 libbtf574 libbtf575 libbtf576
```

after few seconds this line will appear, this line tell you the operation will used additional disk space to continue just print y (y or Y means Yes you agree)

بعد ثواني من تنفيذ الكود سيظهر هذا السطر كما في الشكل التالي، في هذا السطر يخبرك النظام ان هذه العملية سوف تأخذ مساحة إضافية من مساحة القرص لديك لإكمال تنفيذ العملية سأقوم بكتابة  $y$  من ثم الضغط على Enter للموافقة على العملية.

```
ros-noetic-std-srvs ros-noetic-stereo-msgs ros-noetic-tf ros-noetic-tf-conversions ros-noetic-tf2 ros-noetic-tf2-
ros-noetic-tf2-roz ros-noetic-topic-tools ros-noetic-trajectory-msgs ros-noetic-turtle-actionlib ros-noetic-turtle-
ros-noetic-urdf-parser-plugin ros-noetic-urdf-tutorial ros-noetic-visualization-marker-tutorials ros-noetic-visua
ros-noetic-webkit-dependency ros-noetic-xacro ros-noetic-xmllrpcpp sbcl shiboken2 slp-dev tango-icon-theme tk8.6-b
xtrans-dev zllbig-dev
0 upgraded, 638 newly installed, 0 to remove and 29 not upgraded.
Need to get 312 MB of archives.
After this operation, 1606 MB of additional disk space will be used.
Do you want to continue? [Y/n] y
```

this operation will takes some minutes wait until the operating system finished doing this step.

هذه العملية ستأخذ عدة دقائق لذا انتظر قليلا حتى ينتهي نظام التشغيل من تنفيذها.

```
Setting up ros-noetic-interact-ros-kernel-tutorials (0.11.0-1focal.20200529.070119) ...
Setting up ros-noetic-librviz-tutorial (0.11.0-1focal.20200529.074153) ...
Setting up ros-noetic-rqt-msg (0.4.9-1focal.20200529.065139) ...
Setting up ros-noetic-rviz-python-tutorial (0.11.0-1focal.20200529.074228) ...
Setting up ros-noetic-rqt-rviz (0.6.1-1focal.20200529.074200) ...
Setting up ros-noetic-rviz-plugin-tutorials (0.11.0-1focal.20200529.074214) ...
Setting up ros-noetic-rqt-reconfigure (0.5.2-1focal.20200529.065150) ...
Setting up ros-noetic-rqt-robot-dashboard (0.5.8-1focal.20200602.145444) ...
Setting up ros-noetic-visualization-tutorials (0.11.0-1focal.20200529.074738) ...
Setting up ros-noetic-ros-core (1.5.0-1focal.20200529.064752) ...
Setting up ros-noetic-geometry (1.13.1-1focal.20200529.070642) ...
Setting up ros-noetic-rqt-srv (0.4.8-1focal.20200529.065443) ...
Setting up ros-noetic-rqt-action (0.4.9-1focal.20200529.065436) ...
Setting up ros-noetic-rqt-launch (0.4.8-1focal.20200529.065134) ...
Setting up ros-noetic-ros-base (1.5.0-1focal.20200529.065007) ...
Setting up ros-noetic-rqt-robot-plugins (0.5.8-1focal.20200602.150731) ...
Setting up ros-noetic-robot (1.5.0-1focal.20200529.070938) ...
Setting up ros-noetic-rqt-common-plugins (0.4.9-1focal.20200529.065759) ...
Setting up ros-noetic-viz (1.5.0-1focal.20200602.151318) ...
Setting up ros-noetic-desktop (1.5.0-1focal.20200602.151713) ...
wfw@wfw-VirtualBox:~$ echo "source /opt/ros/noetic/setup.bash" >> ~/.bashrc
```

## Environment setup:

To make ROS run every time a new shell is launched, I will put this line inside the script

```
source /opt/ros/noetic/setup.bash
```

لجعل ROS يعمل في جميع النوافذ بدون كتابة خطوات إضافية في كل نافذة فقط سأقوم بوضع السطر التالي في ملف ال bash

```
source /opt/ros/noetic/setup.bash
```

by using this command

الكود التالي سيقوم بتنفيذ العملية السابقة من دون كتابة الامر السابق بشكل مباشر.

```
echo "source /opt/ros/noetic/setup.bash" >> ~/.bashrc
source ~/.bashrc
```

```
wrwr@wrwr-VirtualBox:~$ echo "source /opt/ros/noetic/setup.bash" >> ~/.bashrc
wrwr@wrwr-VirtualBox:~$ source ~/.bashrc
```

## Dependencies for building packages:

I will install this tool (to create and manage my own ROS workspaces) and other dependencies for building ROS packages

سأقوم بتنصيب الادوات التالية لتحكم في ال ROS من خلال انشاء او تعديل بيئة العمل (workspace) , الكود التالي سيقوم بتنصيب rosdep و rosinstall-generator و rosinstall و wstool .

```
sudo apt install python3-rosdep python-rosinstall python-rosinstall-generator python-wstool build-essential
```

because I install python 3 on my Ubuntu I change the command from python to python3

قمت بتغيير الكود من python الى python3 لانني استخدم هذه النسخة.

```
wrwr@wrwr-VirtualBox:/opt/ros/noetic$ sudo apt install python3-rosdep python3-ro
sinstall python3-rosinstall-generator python3-wstool build-essential
Reading package lists... Done
Building dependency tree
Reading state information... Done
build-essential is already the newest version (12.8ubuntu1).
python3-rosinstall is already the newest version (0.7.8-4).
python3-wstool is already the newest version (0.1.18-2).
python3-wstool set to manually installed.
The following NEW packages will be installed:
  python3-rosdep python3-rosinstall-generator
0 upgraded, 2 newly installed, 0 to remove and 122 not upgraded.
Need to get 14.4 kB of archives.
After this operation, 94.2 kB of additional disk space will be used.
Do you want to continue? [Y/n] y
Get:1 http://packages.ros.org/ros/ubuntu focal/main amd64 python3-rosdep all 0.1
9.0-1 [3180 B]
```

After that I initialize rosdep:

بعد ذلك قمت بعملية تهيئة وتحديث rosdep

```
sudo rosdep init
rosdep update
```

```
wrwr@wrwr-VirtualBox:/opt/ros/noetic$ sudo rosdep init
Wrote /etc/ros/rosdep/sources.list.d/20-default.list
Recommended: please run

rosdep update
```

```
wrwr@wrwr-VirtualBox:/opt/ros/noetic$ rosdep update
reading in sources list data from /etc/ros/rosdep/sources.list.d
Hit https://raw.githubusercontent.com/ros/rosdistro/master/rosdep/osx-homebrew.yaml
Hit https://raw.githubusercontent.com/ros/rosdistro/master/rosdep/base.yaml
Hit https://raw.githubusercontent.com/ros/rosdistro/master/rosdep/python.yaml
Hit https://raw.githubusercontent.com/ros/rosdistro/master/rosdep/ruby.yaml
Hit https://raw.githubusercontent.com/ros/rosdistro/master/releases/fuerte.yaml
Query rosdistro index https://raw.githubusercontent.com/ros/rosdistro/master/index-v4.yaml
Skip end-of-life distro "ardent"
Skip end-of-life distro "bouncy"
Skip end-of-life distro "crystal"
Add distro "dashing"
Add distro "eloquent"
Add distro "foxy"
Skip end-of-life distro "groovy"
Skip end-of-life distro "hydro"
Skip end-of-life distro "indigo"
Skip end-of-life distro "jade"
Add distro "kinetic"
Skip end-of-life distro "lunar"
Add distro "melodic"
Add distro "noetic"
Add distro "rolling"
updated cache in /home/wrwr/.ros/rosdep/sources.cache
wrwr@wrwr-VirtualBox:/opt/ros/noetic$
```

Now the installation is completed, to test it see this [tutorial](#).

انتهينا من عملية التنصيب بشكل ناجح ولتأكد من ان الكود يعمل بشكل صحيح [اتبع الخطوات التالية](#).

## References:

- 1 - <http://wiki.ros.org/noetic/Installation/Ubuntu>
- 2 - <https://www.udemy.com/course/ros-basics-program-robots/learn/lecture/8892576#overview>