

Installing ROS 1 Noetic on an offline Ubuntu 20.04 system requires careful preparation, as you won't have internet access to download dependencies or packages during installation. Since you've already downloaded the necessary files and transferred them to the offline system, I'll assume you have the ROS Noetic .deb packages and their dependencies. Below is a step-by-step guide to install ROS 1 Noetic offline on Ubuntu 20.04.

Prerequisites

¹ **Downloaded Files:** Ensure you have:

- All required .deb packages for ROS Noetic (e.g., `ros-noetic-desktop-full`, or your preferred variant like `ros-noetic-desktop` or `ros-noetic-ros-base`).
- All dependencies for these packages (you can use a tool like `apt-rdepends` on an online system to identify them).
- The files should be transferred to a directory on the offline system, e.g.,
`/path/to/deb_files`.

² **Ubuntu 20.04:** The offline system must be running Ubuntu 20.04 (Focal Fossa).

³ **Sufficient Disk Space:** At least 10-15 GB of free space for ROS Noetic and dependencies.

⁴ **Root Access:** You need `sudo` privileges to install packages.

Step-by-Step Installation

1 Prepare the Offline System

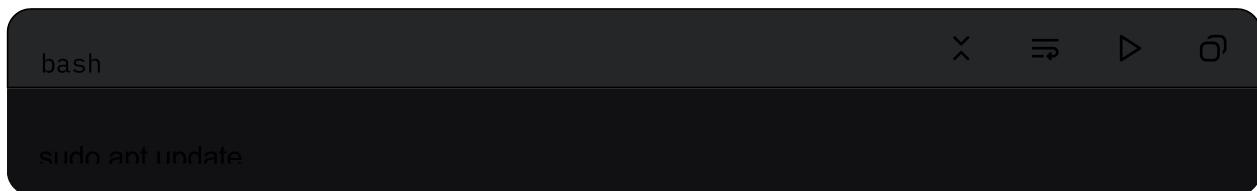
- Ensure the system is running Ubuntu 20.04. Verify with:



A terminal window with a dark background and light-colored text. The title bar says "bash". The command "lsb_release -a" is typed into the terminal. The output shows the system's name, version, and other details.

```
lsb_release -a
```

- Update the package list (optional, but ensures the system is ready to install .deb files):



A terminal window with a dark background and light-colored text. The title bar says "bash". The command "sudo apt update" is typed into the terminal. The output shows the progress of updating the package list.

```
sudo apt update
```

If this step fails due to lack of internet, proceed, as you'll manually install packages.

2 Copy Downloaded .deb Files

- Transfer all .deb files to a directory on the offline system, e.g.,
`/path/to/deb_files`.
- Ensure the directory contains all dependencies for the ROS Noetic packages. If you miss dependencies, the installation will fail.

³ Install Dependencies and ROS Packages

- Navigate to the directory containing the .deb files:

```
bash
cd /path/to/deb_files
```

- Install all .deb files using dpkg. Since dependencies must be resolved, use apt to handle them (it can install local .deb files and resolve dependencies if all required files are present):

```
bash
sudo apt install /* deb
```

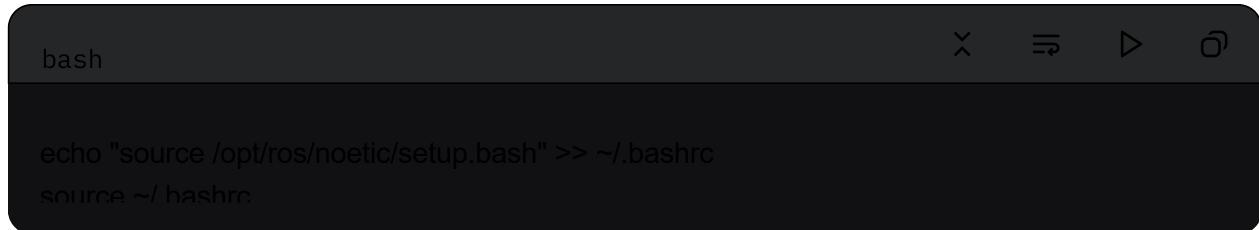
- This command tells apt to install all .deb files in the current directory, automatically resolving dependencies among them.
- If you encounter errors about missing dependencies, ensure all required .deb files are in the directory. You may need to collect additional dependencies from an online system (see **Collecting Dependencies** below).
- Alternatively, if apt fails, use dpkg directly, but you must manually ensure dependencies are installed in the correct order:

```
bash
sudo dpkg -i * deb
```

- If dpkg reports missing dependencies, install those specific .deb files first, then retry.

4 Set Up the ROS Environment

- After successful installation, configure the ROS environment by adding it to your shell's startup script (e.g., for `bash`):



A screenshot of a terminal window titled "bash". The window has a dark theme with light-colored text. It contains the following command:

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

- If you use another shell (e.g., `zsh`), replace `~/.bashrc` with the appropriate file (e.g., `~/.zshrc`).

5 Install rosdep (Optional, for Development)

- If you plan to build ROS packages, you need `rosdep`. Since the system is offline, you can't run `rosdep update`. Instead:
 - On an online system, download the `rosdep` data:

```
bash
rosdep update
```

- Copy the `rosdep` data from `~/.ros/rosdep` to the offline system's `~/.ros/rosdep`.
- On the offline system, set up `rosdep`:

```
bash
sudo rosdep init
```

- If `rosdep init` fails due to no internet, manually place the `rosdep` data in `/etc/ros/rosdep` and configure it:

```
bash
sudo mkdir -p /etc/ros/rosdep
sudo cp -r ~/ros/rosdep/* /etc/ros/rosdep/
```

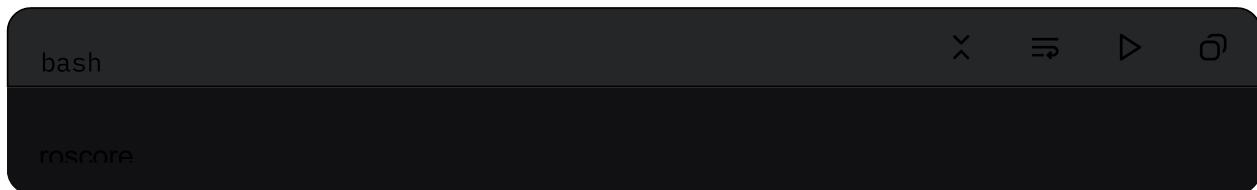
6 Verify Installation

- Check if ROS is installed correctly:



```
bash
rosversion -d
```

- This should output `noetic`.
- Test the ROS environment:



```
bash
roscore
```

- If `roscore` runs without errors, ROS is installed correctly.

7 Optional: Install Additional Tools

- If you need tools like `rviz`, `rqt`, or `rosbag`, ensure their `.deb` files (e.g., `ros-noetic-rviz`, `ros-noetic-rqt`) were included in your downloaded packages and installed in Step 3.

Collecting Dependencies (If Needed)

If you haven't collected all dependencies, you can do so on an online Ubuntu 20.04 system:

1 Simulate Installation:

- On an online system, add the ROS repository:

```
bash
x  ≡  ▶  ⌂

sudo sh -c 'echo "deb http://packages.ros.org/ros/ubuntu focal main" > /etc/apt/sources.list.d/ros-latest.list'
sudo apt-key adv --keyserver 'hkp://keyserver.ubuntu.com:80' --recv-key C1CF6E31E6BADE8829B11D3A4F407BC
sudo apt update
```

- Use `apt-rdepends` to list dependencies:

```
bash
x  ≡  ▶  ⌂

sudo apt install apt-rdepends
apt-rdepends ros-noetic-desktop-full > dependencies.txt
```

- Parse `dependencies.txt` to identify all required packages.

2 Download .deb Files:

- Use `apt download` to fetch all `.deb` files:

```
bash
x  ≡  ▶  ⌂

apt download $(apt-rdepends ros-noetic-desktop-full | grep -v "Depends" | sort | uniq)
```

- This downloads all `.deb` files to the current directory.
- Transfer these files to the offline system.

³ Alternative: Use apt-offline:

- Install apt-offline on both systems:

```
bash
sudo apt install apt-offline
```

- On the offline system, generate a signature file:

```
bash
apt-offline set --install-packages ros-noetic-desktop-full offline.sig
```

- Transfer offline.sig to the online system, fetch packages:

```
bash
apt-offline get offline.sig --bundle offline.zip
```

- Transfer offline.zip to the offline system and install:

```
bash
apt-offline install offline.zip
sudo apt install ros-noetic-desktop-full
```

Troubleshooting

• Missing Dependencies: If you encounter missing dependencies, run the command:

MISSING DEPENDENCIES: If `apt-get` or `apt` reports missing dependencies, ensure all required `.deb` files are in the directory. Use `apt-rdepends` on an online system to identify and download missing packages.

- **Broken Packages:** Run `sudo apt --fix-broken install` to resolve issues, or manually install missing dependencies with `dpkg`.
- **GPG Key Errors:** If you encounter key errors, ensure the ROS GPG key is installed (included in Step 3 of **Collecting Dependencies**).
- **Space Issues:** Ensure sufficient disk space with `df -h`. ROS Noetic requires significant storage.

Notes

- **ROS Variant:** Replace `ros-noetic-desktop-full` with `ros-noetic-desktop` or `ros-noetic-ros-base` if you downloaded a different variant.
- **Offline Constraints:** Without internet, you must have all `.deb` files upfront. Missing even one dependency will halt installation.
- **Workspace Setup:** After installation, set up a catkin workspace for development:

```
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mkdir -p ~/catkin_ws/src
cd ~/catkin_ws
catkin_make
echo "source ~/catkin_ws/devel/setup.bash" >> ~/.bashrc
```

If you encounter specific errors or need help with a particular step, please provide details, and I can guide you further!