Robot Operating Systems

Robot Software Development

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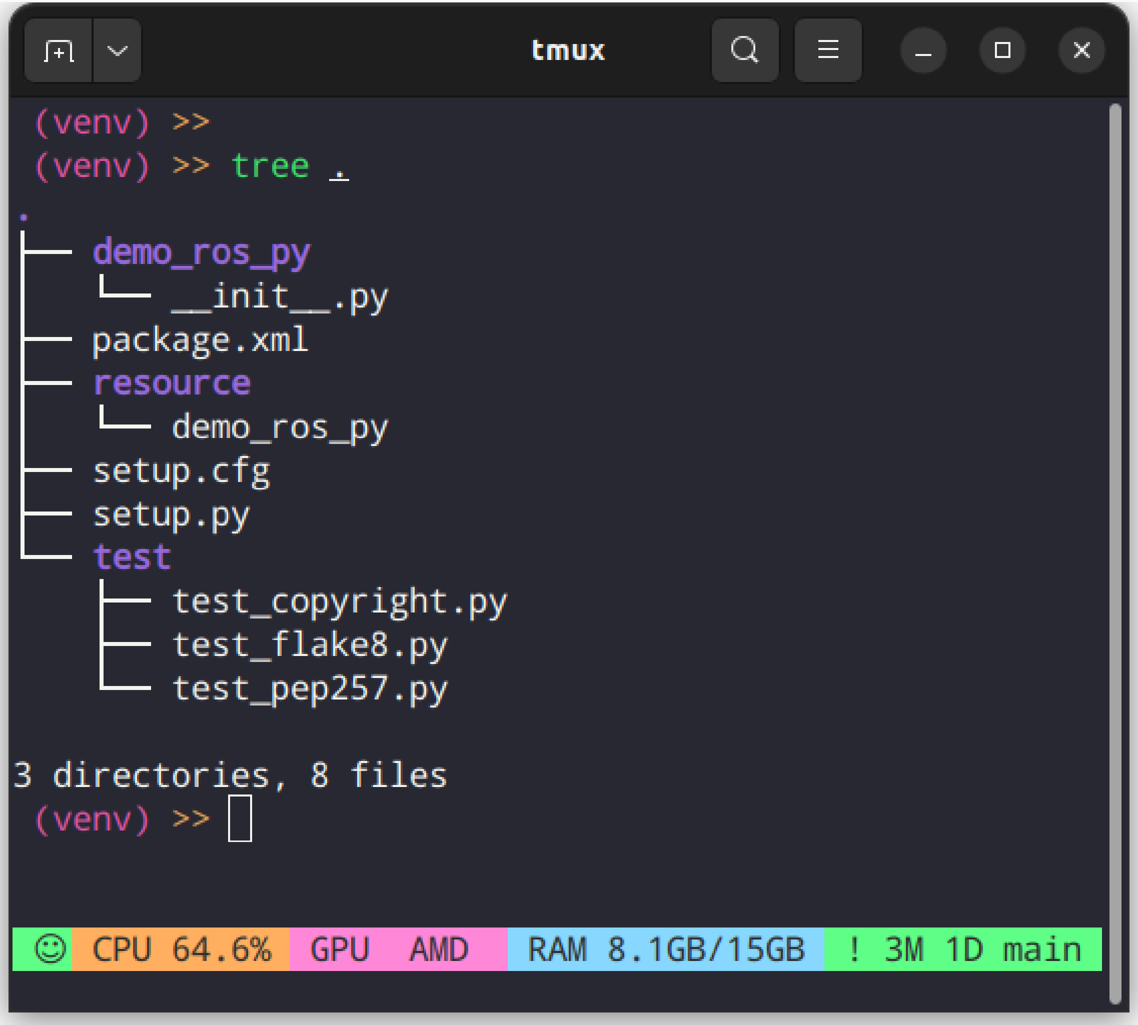
MT @ ISET Bizerte

Outline

Bash

```bash
ros2 pkg create --build-type ament_python <package_name>
```

Outline



```
(venv) >>
(venv) >> tree .
.
├── demo_ros_py
│   └── __init__.py
├── package.xml
├── resource
│   └── demo_ros_py
├── setup.cfg
├── setup.py
└── test
    ├── test_copyright.py
    ├── test_flake8.py
    └── test_pep257.py

3 directories, 8 files
(venv) >>
```

Outline

This command creates a new **ROS2** package with the specified name, using the `ament_python` build type. The generated package structure will look like this:

Outline

```
<package_name>/
├── package.xml
├── setup.py
├── setup.cfg
├── resource/
│   └── <package_name>
├── test/
│   ├── test_copyright.py
│   ├── test_flake8.py
│   └── test_pep257.py
└── <package_name>/
    └── __init__.py
```

Outline

Info

Root Level Files

package.xml The package manifest file containing metadata about the package (*dependencies, version, description, maintainer info, etc.*)

setup.py Python setup script that defines how the package should be built and installed

setup.cfg Configuration file for setup tools, typically contains console script entry points

To install the required dependencies, we need to navigate to the package directory and run:

```bash
rosdep install -i --from-path src/<package_name> --rosdistro humble -y
```

Bash

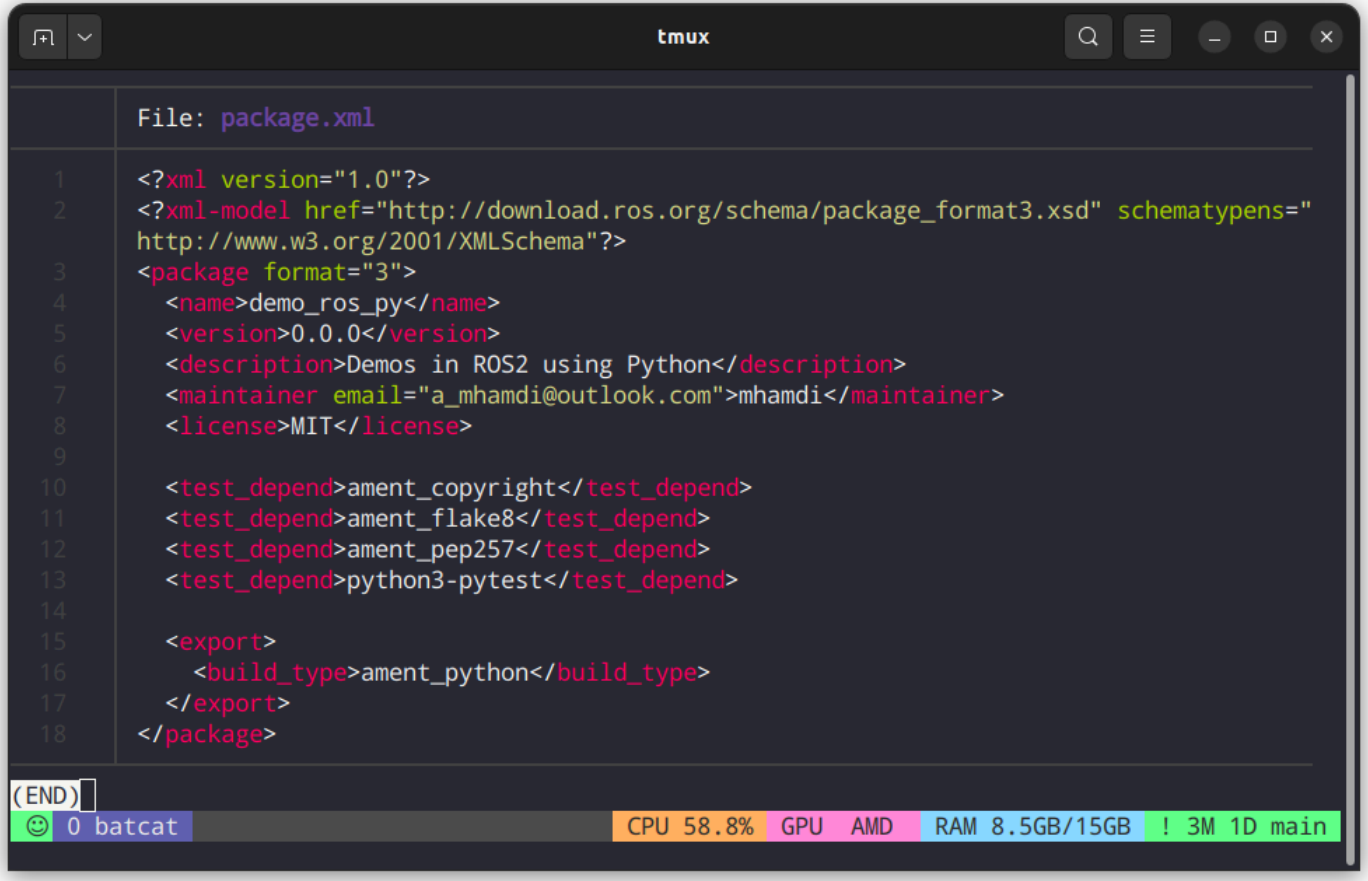
Outline

The `package.xml` file is a package manifest for **ROS2** that describes the package. It's written in **XML** and includes key information like:

- **Metadata:** The package's name, version, a description, maintainer information, and license.
- **Dependencies:** Other packages required for the current package to build and run.
- **Build System Info:** Details on the build type, such as `ament_python`.
- **Export Tags:** Extra information for the **ROS2** build system.

Essentially, this file is how **ROS2** manages dependencies and compiles our package.

Outline



```
File: package.xml
```

```xml
<?xml version="1.0"?>
<?xml-model href="http://download.ros.org/schema/package_format3.xsd" schematypens="
http://www.w3.org/2001/XMLSchema"?>
<package format="3">
  <name>demo_ros_py</name>
  <version>0.0.0</version>
  <description>Demos in ROS2 using Python</description>
  <maintainer email="a_mhamdi@outlook.com">mhamdi</maintainer>
  <license>MIT</license>

  <test_depend>ament_copyright</test_depend>
  <test_depend>ament_flake8</test_depend>
  <test_depend>ament_pep257</test_depend>
  <test_depend>python3-pytest</test_depend>

  <export>
    <build_type>ament_python</build_type>
  </export>
</package>
```

```
(END)
☺ 0 batcat                    CPU 58.8%  GPU  AMD  RAM 8.5GB/15GB  ! 3M 1D main
```

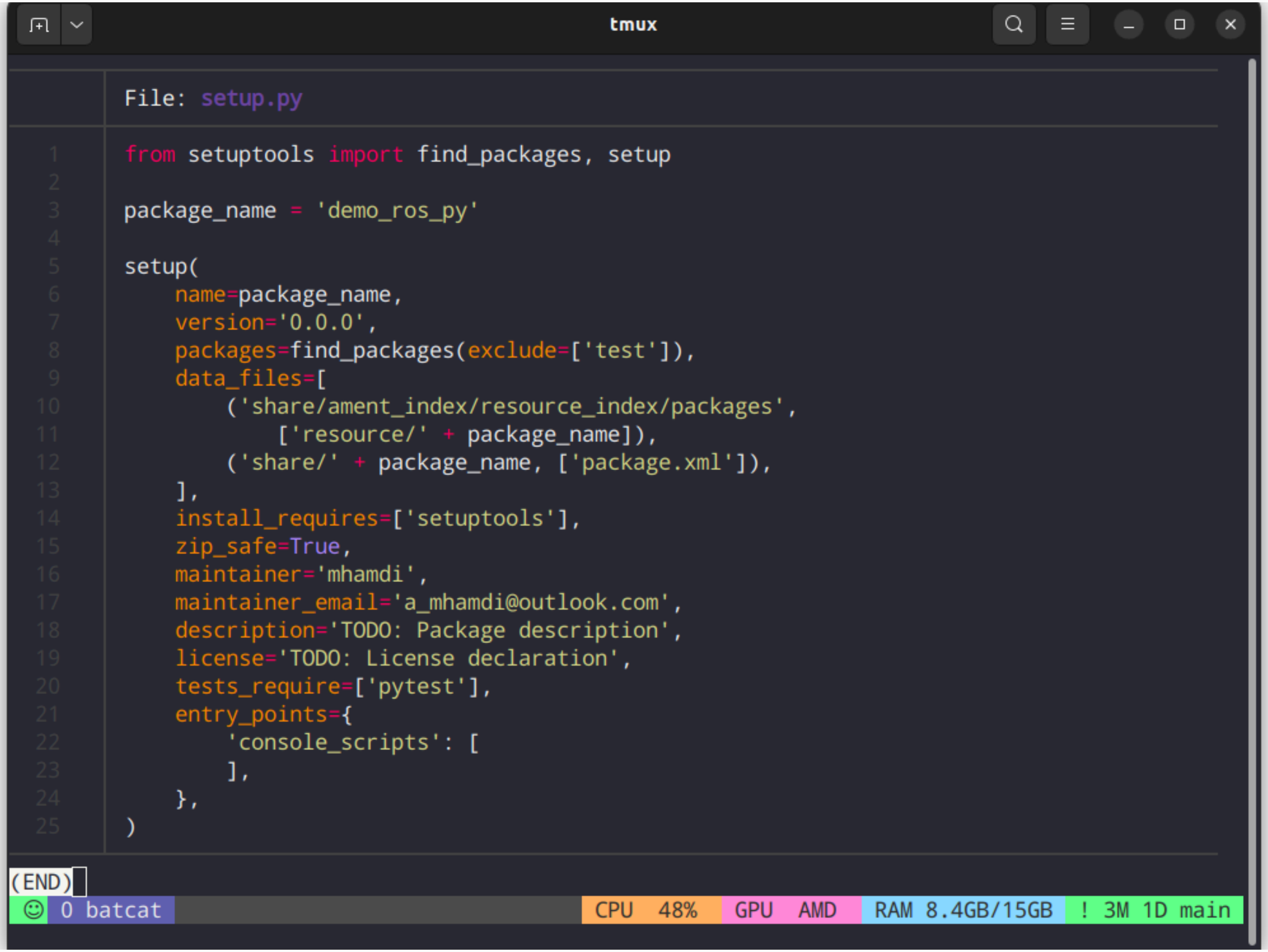
Outline

The `setup.py` file is a **Python** script that provides instructions for installing a **ROS2** package. It includes:

- **Metadata:** Package details such as the name, version, and author, which are often sourced from package.xml.
- **Dependencies:** The required Python packages for the project.
- **Entry Points:** Specifies console scripts that define **ROS2** nodes, allowing them to be run as executable commands.
- **Data Files:** Information on any extra files, like launch files or configurations, that need to be installed.
- **Package Discovery:** Instructions for setuptools on which **Python** packages to include.

This file uses a standard **Python** packaging mechanism to work with the ament build system, making it possible to install and run our **Python** nodes as **ROS2** executables.

Outline



```
File: setup.py
```

```python
from setuptools import find_packages, setup

package_name = 'demo_ros_py'

setup(
    name=package_name,
    version='0.0.0',
    packages=find_packages(exclude=['test']),
    data_files=[
        ('share/ament_index/resource_index/packages',
            ['resource/' + package_name]),
        ('share/' + package_name, ['package.xml']),
    ],
    install_requires=['setuptools'],
    zip_safe=True,
    maintainer='mhamdi',
    maintainer_email='a_mhamdi@outlook.com',
    description='TODO: Package description',
    license='TODO: License declaration',
    tests_require=['pytest'],
    entry_points={
        'console_scripts': [
        ],
    },
)
```

```
(END)
☺ 0 batcat                    CPU 48%  GPU AMD  RAM 8.4GB/15GB  ! 3M 1D main
```

Outline

Info

Directories

resource/<package_name> Contains a marker file (*usually empty*) that helps **ROS2** identify this as a package

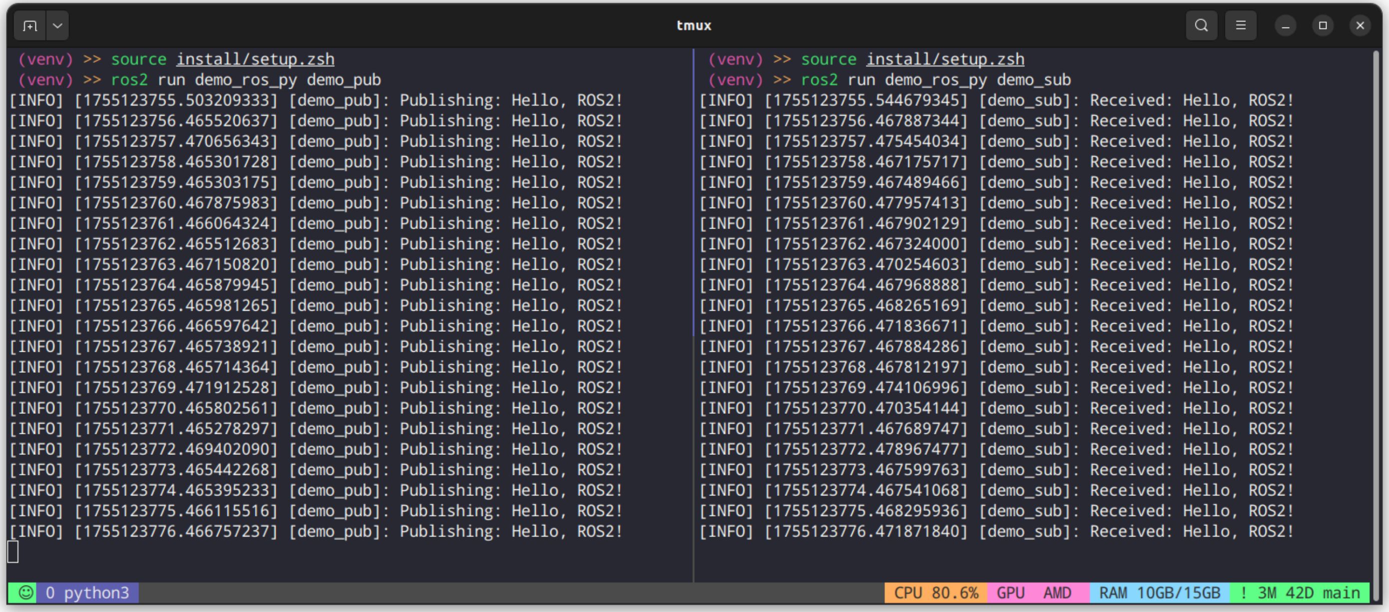
test/ Contains basic test files:

- **test_copyright.py** Checks for proper copyright headers
- **test_flake8.py** Runs `flake8` linting
- **test_pep257.py** Checks docstring conventions

<package_name>/ The main Python module directory where we'll write our actual **Python** code

- **__init__.py** Makes this directory a Python package

Outline



```
(venv) >> source install/setup.zsh
(venv) >> ros2 run demo_ros_py demo_pub
[INFO] [1755123755.503209333] [demo_pub]: Publishing: Hello, ROS2!
[INFO] [1755123756.465520637] [demo_pub]: Publishing: Hello, ROS2!
[INFO] [1755123757.470656343] [demo_pub]: Publishing: Hello, ROS2!
[INFO] [1755123758.465301728] [demo_pub]: Publishing: Hello, ROS2!
[INFO] [1755123759.465303175] [demo_pub]: Publishing: Hello, ROS2!
[INFO] [1755123760.467875983] [demo_pub]: Publishing: Hello, ROS2!
[INFO] [1755123761.466064324] [demo_pub]: Publishing: Hello, ROS2!
[INFO] [1755123762.465512683] [demo_pub]: Publishing: Hello, ROS2!
[INFO] [1755123763.467150820] [demo_pub]: Publishing: Hello, ROS2!
[INFO] [1755123764.465879945] [demo_pub]: Publishing: Hello, ROS2!
[INFO] [1755123765.465981265] [demo_pub]: Publishing: Hello, ROS2!
[INFO] [1755123766.466597642] [demo_pub]: Publishing: Hello, ROS2!
[INFO] [1755123767.465738921] [demo_pub]: Publishing: Hello, ROS2!
[INFO] [1755123768.465714364] [demo_pub]: Publishing: Hello, ROS2!
[INFO] [1755123769.471912528] [demo_pub]: Publishing: Hello, ROS2!
[INFO] [1755123770.465802561] [demo_pub]: Publishing: Hello, ROS2!
[INFO] [1755123771.465278297] [demo_pub]: Publishing: Hello, ROS2!
[INFO] [1755123772.469402090] [demo_pub]: Publishing: Hello, ROS2!
[INFO] [1755123773.465442268] [demo_pub]: Publishing: Hello, ROS2!
[INFO] [1755123774.465395233] [demo_pub]: Publishing: Hello, ROS2!
[INFO] [1755123775.466115516] [demo_pub]: Publishing: Hello, ROS2!
[INFO] [1755123776.466757237] [demo_pub]: Publishing: Hello, ROS2!
```

```
(venv) >> source install/setup.zsh
(venv) >> ros2 run demo_ros_py demo_sub
[INFO] [1755123755.544679345] [demo_sub]: Received: Hello, ROS2!
[INFO] [1755123756.467887344] [demo_sub]: Received: Hello, ROS2!
[INFO] [1755123757.475454034] [demo_sub]: Received: Hello, ROS2!
[INFO] [1755123758.467175717] [demo_sub]: Received: Hello, ROS2!
[INFO] [1755123759.467489466] [demo_sub]: Received: Hello, ROS2!
[INFO] [1755123760.477957413] [demo_sub]: Received: Hello, ROS2!
[INFO] [1755123761.467902129] [demo_sub]: Received: Hello, ROS2!
[INFO] [1755123762.467324000] [demo_sub]: Received: Hello, ROS2!
[INFO] [1755123763.470254603] [demo_sub]: Received: Hello, ROS2!
[INFO] [1755123764.467968888] [demo_sub]: Received: Hello, ROS2!
[INFO] [1755123765.468265169] [demo_sub]: Received: Hello, ROS2!
[INFO] [1755123766.471836671] [demo_sub]: Received: Hello, ROS2!
[INFO] [1755123767.467884286] [demo_sub]: Received: Hello, ROS2!
[INFO] [1755123768.467812197] [demo_sub]: Received: Hello, ROS2!
[INFO] [1755123769.474106996] [demo_sub]: Received: Hello, ROS2!
[INFO] [1755123770.470354144] [demo_sub]: Received: Hello, ROS2!
[INFO] [1755123771.467689747] [demo_sub]: Received: Hello, ROS2!
[INFO] [1755123772.478967477] [demo_sub]: Received: Hello, ROS2!
[INFO] [1755123773.467599763] [demo_sub]: Received: Hello, ROS2!
[INFO] [1755123774.467541068] [demo_sub]: Received: Hello, ROS2!
[INFO] [1755123775.468295936] [demo_sub]: Received: Hello, ROS2!
[INFO] [1755123776.471871840] [demo_sub]: Received: Hello, ROS2!
```

```
☺ 0 python3                                  CPU 80.6%  GPU  AMD  RAM 10GB/15GB  ! 3M 42D main
```

Thank you for your attention

Bibliography

Bibliography

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