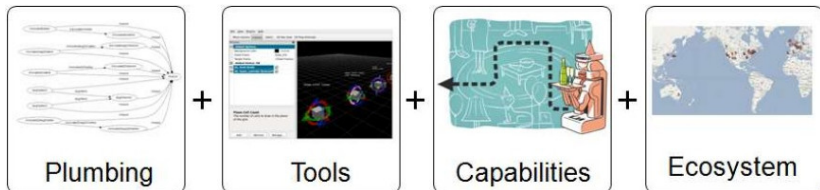


Tooling in 2

Olivier Kermorgant

ANF ROS2

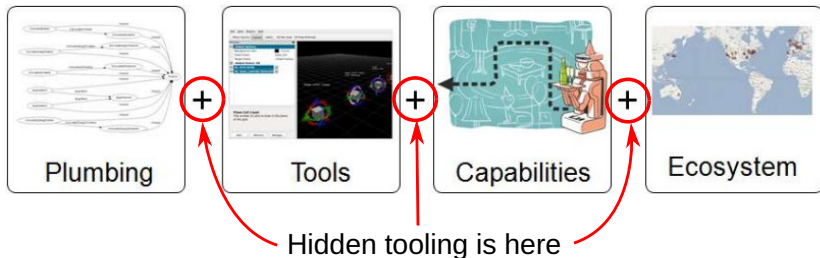
What kind of tooling do we need?



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Environment variables
(super)-build tools
Network behavior
Packaging

Workspaces
magic of `setup.bash`
colcon
Tuning DDS
bloom

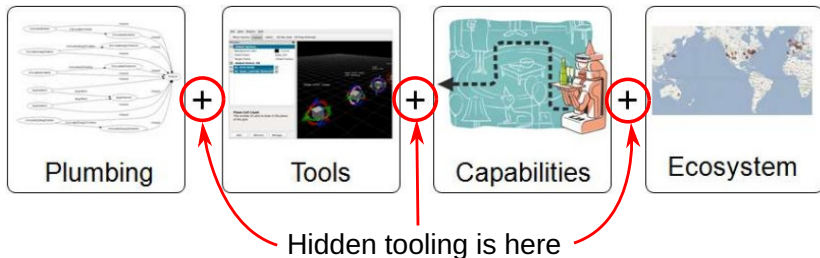
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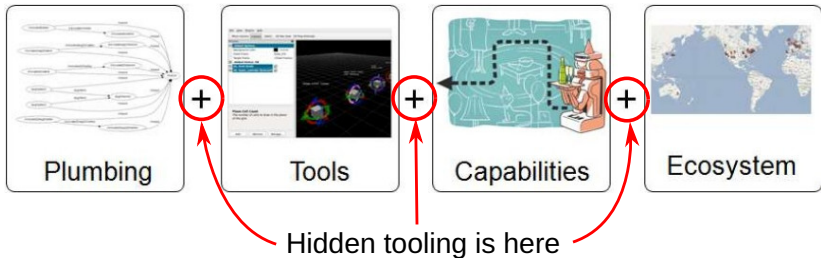
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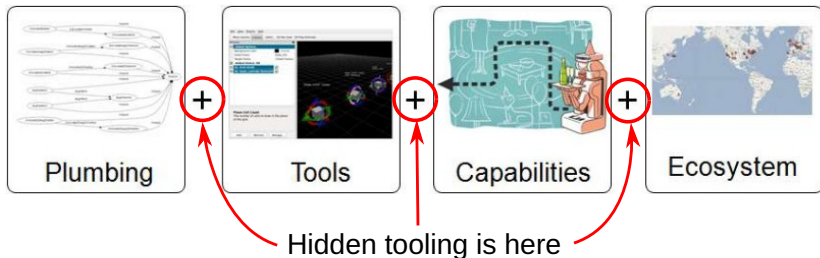
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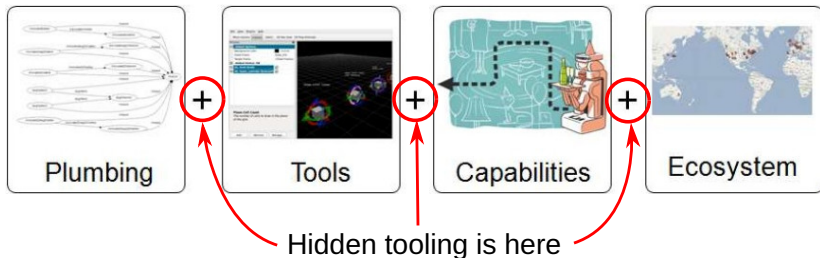
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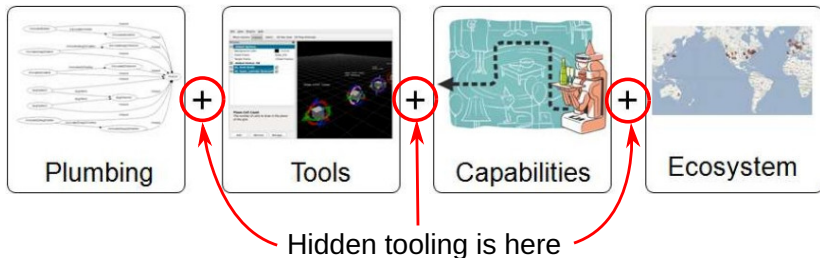
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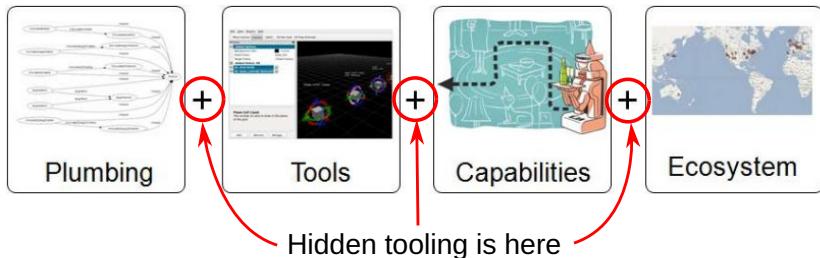
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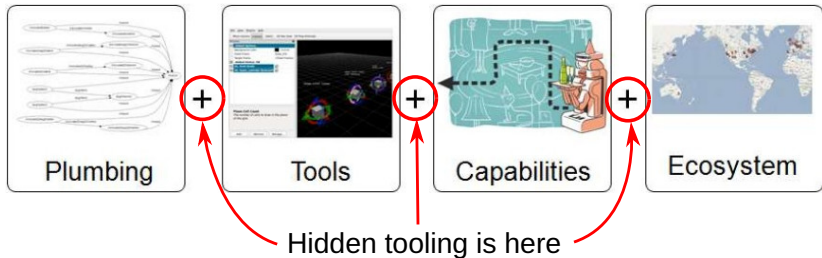
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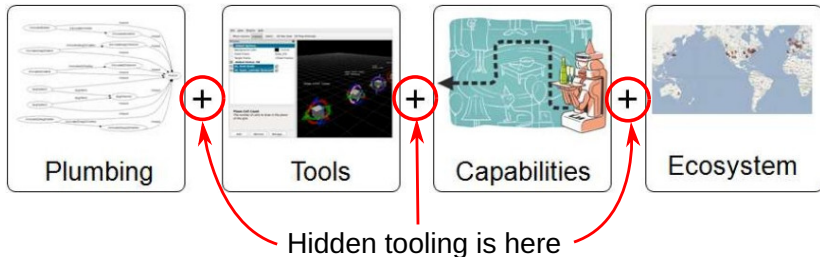
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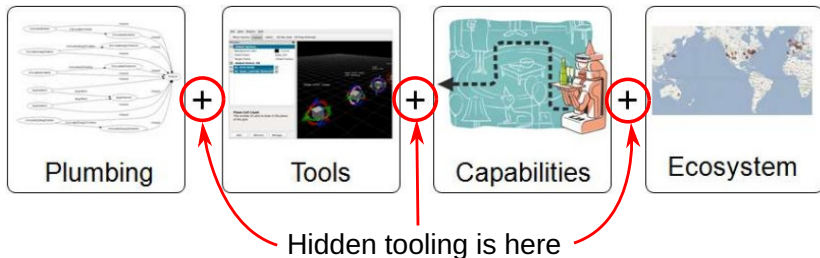
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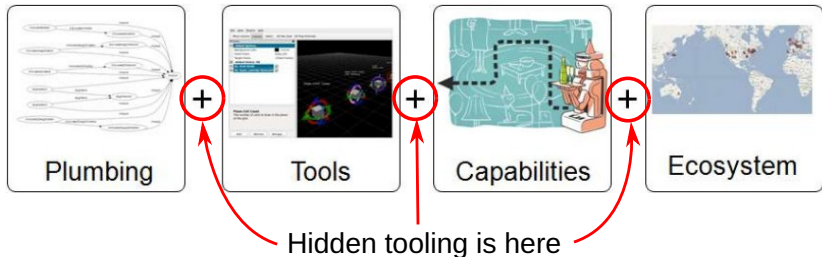
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History of distributions - Long Term Support are what you want

First commit



In 2017: 200000 commits made by more than 2800 users

More than 2000 forks of rosdistro from package developers

Any ROS file is part of a given package

- Atomic way to share and identify code
- Can be CMake-based or pure Python

A package is identified by its `package.xml` file

- Give the name + dependencies (other ROS packages or other libraries)

```
1 <?xml version="1.0"?>
2 <package format="3">
3   <name>simulation_2d</name>
4   <version>2.0.0</version>
5   <description>The simulation2D package</description>
6   <maintainer email="olivier.kermorgant@ec-nantes.fr">Olivier Kermorgant</maintainer>
7
8   <license>MIT</license>
9   <buildtool_depend>ament_cmake</buildtool_depend>
10
11   <depend>geometry_msgs</depend>
12   <depend>rclcpp</depend>
13   <depend>sensor_msgs</depend>
14   <depend>urdfdom</depend>
15
16   <export>
17     <build_type>ament_cmake</build_type>
18   </export>
19 </package>
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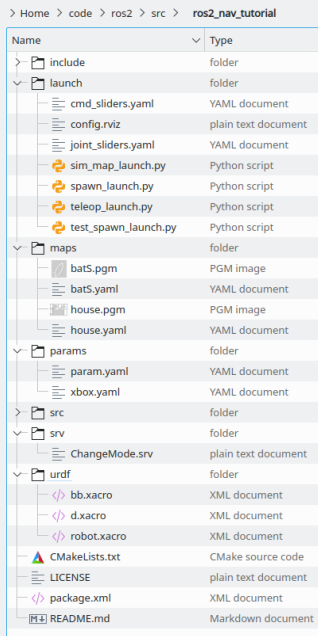
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The screenshot shows a file explorer window for the directory `ros2_nav_tutorial`. The file list is as follows:

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teleop_launch.py	Python script
test_spawn_launch.py	Python script
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param.yaml	YAML document
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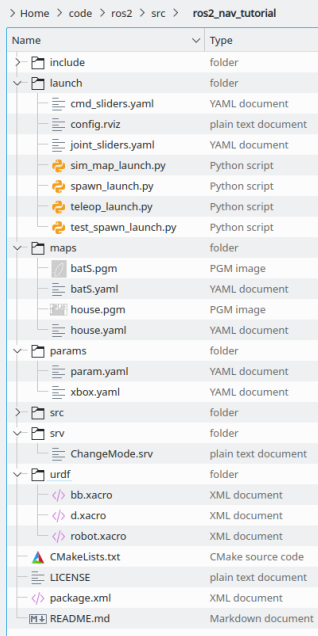
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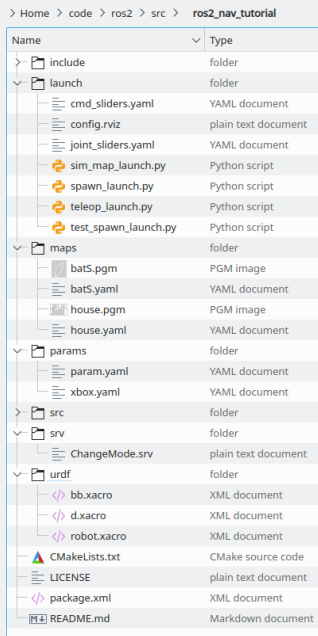
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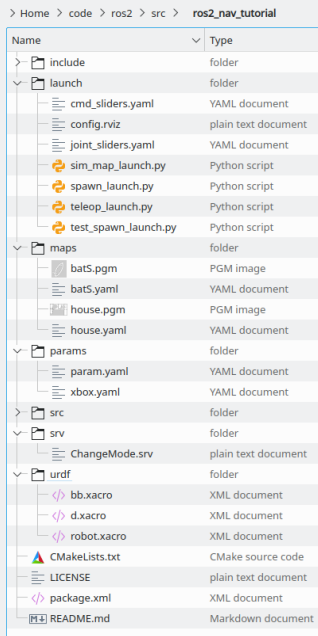
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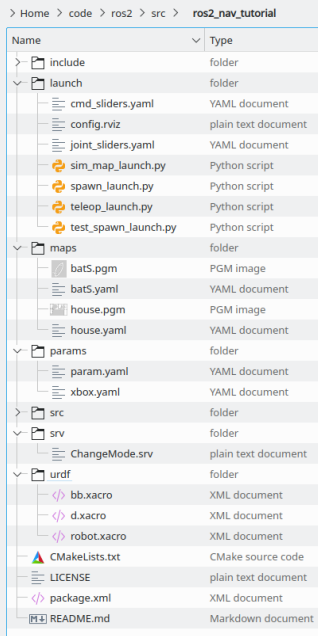
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Packages have to be placed in specific directories: *workspaces*

`colcon`: super build tool for ROS 2

- Compiles all packages of the workspace

Symbolic install

- Python code / files always up-to-date
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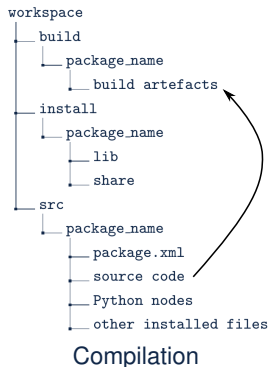
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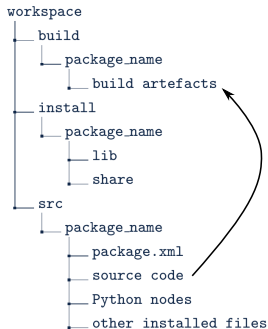
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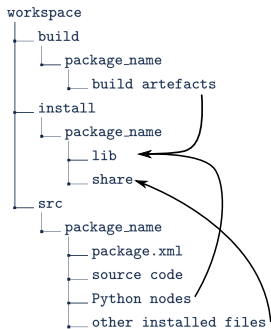
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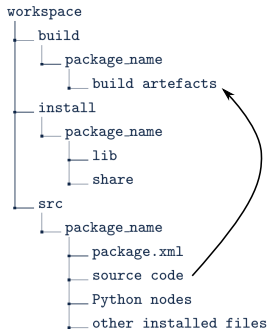
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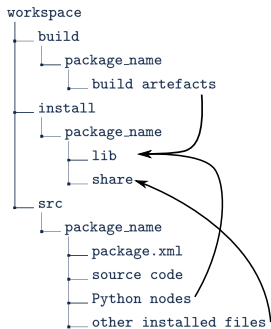
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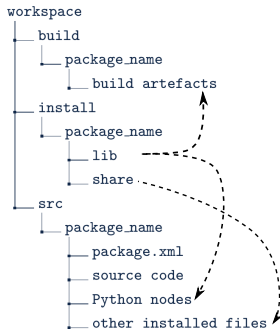
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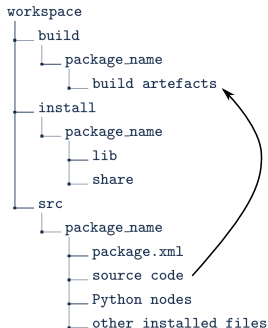
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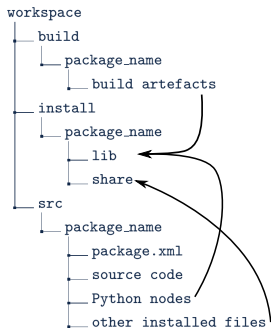
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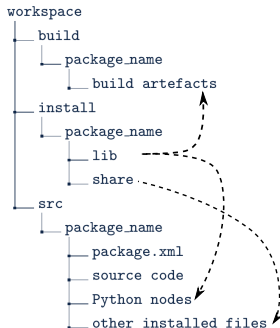
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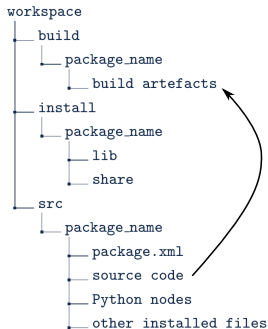
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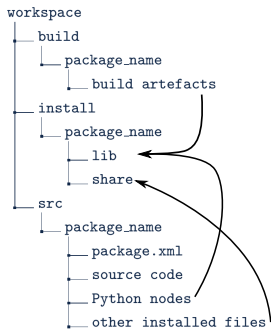
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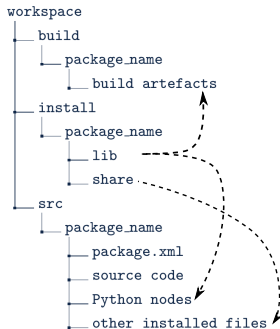
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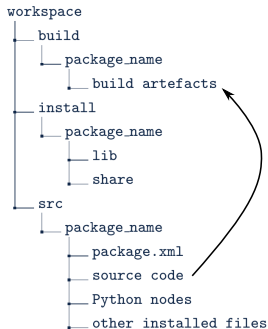
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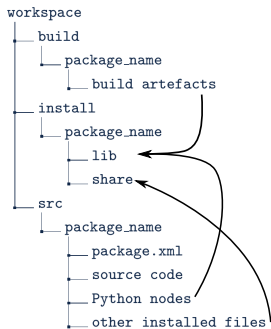
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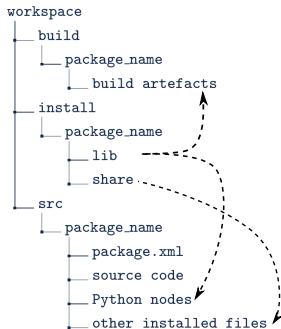
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A given terminal only knows about *sourced* workspaces

```
source /opt/humble/setup.bash
source /some/other/workspace/install/setup.bash
source ~/my_main_ws/install/setup.bash
```

- Can be done in `~/ .bashrc`
- Careful when using GUI applications

Notion of overlay: sourcing order opposed to lookup order

- Packages and overlays are cheap
- Last sourced workspace overrides any existing package
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Notion of overlay: sourcing order opposed to lookup order

- Packages and overlays are cheap
- Last sourced workspace overrides any existing package
- Useful to test a new feature even on official packages

A given terminal only knows about *sourced* workspaces

```
source /opt/humble/setup.bash
source /some/other/workspace/install/setup.bash
source ~/my_main_ws/install/setup.bash
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Sourcing a workspace appends to numerous environment variables

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CMAKE_PREFIX_PATH  
PYTHONPATH  
LD_LIBRARY_PATH  
PATH  
...
```

Mixing ROS 1 & 2: sourcing both ROS 1 and ROS 2 workspaces

- Numerous cryptic compilation or runtime errors

Some tools helps dealing with the two

```
# define ROS 1 and ROS 2 workspaces  
ros1_workspaces="/opt/ros/noetic ~/code/libs/ros ~/code/ros"  
ros2_workspaces="/opt/ros/foxy ~/code/libs/ros2 ~/code/ros2"  
# source the tool  
source ros_management.bash  
# activate ROS 2 after cleaning environment variables from ROS 1  
ros2ws
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ROS 1 needs a ROS master / roscore

- Not running by default
- Multi-computer possible if same master URI

Defaults in ROS 2 are the opposite

- No master
- Auto-discovery
- On the whole network

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Limiting traffic to localhost

```
export ROS_LOCALHOST_ONLY=1
```

Connect only with some other computers

```
unset ROS_LOCALHOST_ONLY # we want the network  
export ROS_DOMAIN_ID=42 # only those will see me
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Autodiscovery is still here

- Can be disabled (depends on DDS vendor...)

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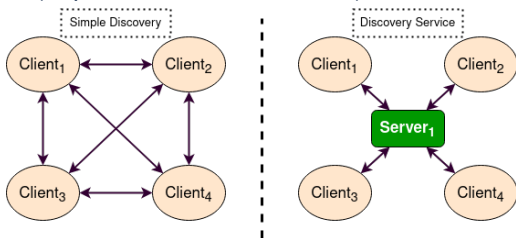
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Limiting traffic to any network interface

- Depends on DDS vendor: editing a few XML

```
ros_restrict ETH # with ros_management_tools
```

Fine-tuning discovery: ROS_AUTOMATIC_DISCOVERY_RANGE

- since Iron

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SUBNET # default: any reachable node  
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- Discovery is not connection!
A node may still be discovered by another one

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ros2cd <package> # jumps to package directory

colbuild # colcon build --symlink-install --continue-on-error
          # also works from anywhere inside the workspace
          # also ensures clean sourcing of ROS 2 workspaces

colbuild -p <packages> # same as --packages-select
colbuild -pu <packages> # same as --packages-up-to

colbuild -t or --this # compiles the package we are in
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https://github.com/oKermorgant/ros_management_tools


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-  https://github.com/oKermorgant/ros_management_tools
-  and probably many others