Configuring Fast DDS for ROS 2 Multi-Machine Communication

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1 Introduction

This guide explains how to configure Fast DDS Discovery Server to enable ROS 2 nodes to communicate across different machines in a local network. This setup is useful in scenarios where multiple devices publish and subscribe to one/multiple topics across a network.

2 Overview

To make ROS 2 nodes visible across machines:

- A central Discovery Server must be launched on one machine.
- Each participating device must point to this server using the `ROS_DISCOVERY_SERVER` environment variable.
- A setup script can simplify the configuration for each machine.

3 Setup Instructions

3.1 Step 1: Create the Setup Script

Create a file `setup-ros2-discovery.sh` with the following content. Modify the IP address accordingly:

```
export RMW_IMPLEMENTATION=rmw_fastrtps_cpp
export ROS_DISCOVERY_SERVER=127.0.0.1:11811
export ROS_SUPER_CLIENT=True
```

Note:

- On the server machine (e.g., your PC), set `ROS_DISCOVERY_SERVER` to `127.0.0.1` (i.e., localhost).
- On client devices (e.g., a robot or Raspberry Pi), set `ROS_DISCOVERY_SERVER` to the IP address of the `server machine` (e.g., your PC). Use `ifconfig`, `ipconfig` or `ip a` to find it.

3.2 Step 3: Start the Fast DDS Discovery Server

On the server machine, run:

```
fastdds discovery --server-id 0
```

3.3 Step 3: Source the Setup Script

On each machine (all clients), source the script in every terminal before running ROS 2 commands:

```
source setup-ros2-discovery.sh
```

3.4 Step 4: Launch ROS 2 Nodes

After the server is running and setup script is sourced in the terminal on client machine:

- *ros2 topic list* should show all the topics on the network.
- You can start the ROS 2 nodes (e.g., your publisher or subscriber).
- You should now see the topics on other machines.

4 Troubleshooting

- If topics are not visible, try restarting the ROS 2 daemon:

  ```
  ros2 daemon stop
  ```

  Then try listing topics again.
- Make sure the firewall is not blocking port `11811` on the server machine.
- Ensure the setup script is sourced in all terminals used for ROS 2 commands.

5 Custom Interfaces

If using custom message types (e.g., from a Vicon system), ensure the corresponding ROS 2 packages are built and sourced. For example:

```
colcon build
source install/setup.bash
```

Failing to source custom interfaces may lead to type errors.

6 Conclusion

This setup allows ROS 2 nodes across different machines to communicate through a central Fast DDS Discovery Server.