
ORCA*ROS* Documentation

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ORCA ROS

ROS wrappers for the ultimately awesome ORCA library.

1.1 Table of Contents

1.1.1 Installation and Configuration

This guide will take you through the steps to install ORCA on your machine. ORCA is cross platform so you should be able to install it on Linux, OSX, and Windows.

Dependencies

- A modern **c++11** compiler (gcc > 4.8 or clang > 3.8)
- **cmake** > 3.1
- **iDynTree** (optional, shipped)
- **qpOASES** 3 (optional, shipped)
- **Eigen** 3 (optional, shipped)
- **Gazebo** 8 (optional)

ORCA is self contained! That means that it ships with both **iDynTree** and **qpOASES** inside the project, allowing for fast installations and easy integration on other platforms. Therefore you can start by simply building ORCA from source and it will include the necessary dependencies so you can get up and running.

Always keep in mind that it's better to install the dependencies separately if you plan to use **iDynTree** or **qpOASES** in other projects. For now only **iDynTree** headers appear in public headers, but will be removed eventually to ease the distribution of this library.

If you want to install the dependencies separately please read the following section: [Installing the dependencies](#). Otherwise, if you just want to get coding, then jump ahead to [Installing ORCA](#).

Note: You can almost always avoid calling `sudo`, by calling `cmake .. -DCMAKE_INSTALL_PREFIX=/some/dir` and exporting the `CMAKE_PREFIX_PATH` variable: `export CMAKE_PREFIX_PATH=$CMAKE_PREFIX_PATH:/some/dir`.

Installing the dependencies

This installation requires you to build the dependencies separately, but will give you better control over versioning and getting the latest features and bug fixes.

Eigen

```
wget http://bitbucket.org/eigen/eigen/get/3.3.4.tar.bz2
tar xjvf 3.3.4.tar.bz2
cd eigen-eigen-dc6cfd9bcec
mkdir build ; cd build
cmake --build .
sudo cmake --build . --target install
```

qpOASES

```
wget https://www.coin-or.org/download/source/qpOASES/qpOASES-3.2.1.zip
unzip qpOASES-3.2.1.zip
cd qpOASES-3.2.1
mkdir build ; cd build
cmake .. -DCMAKE_CXX_FLAGS="-fPIC" -DCMAKE_BUILD_TYPE=Release
cmake --build .
sudo cmake --build . --target install
```

iDynTree

```
git clone https://github.com/robotology/idyntree
cd idyntree
mkdir build ; cd build
cmake .. -DCMAKE_BUILD_TYPE=Release
cmake --build .
sudo cmake --build . --target install
```

Gazebo

Examples are built with Gazebo 8. They can be adapted of course to be backwards compatible.

```
curl -sSL http://get.gazebosim.org | sh
```

Installing ORCA

Whether or not you have installed the dependencies separately, you are now ready to clone, build and install ORCA. Hooray.

```
git clone https://github.com/syroco/orca
cd orca
mkdir build ; cd build
cmake .. -DCMAKE_BUILD_TYPE=Release
cmake --build .
sudo cmake --build . --target install
```

Testing your installation

Assuming you followed the directions to the letter and encountered no compiler errors along the way, then you are ready to get started with ORCA. Before moving on to the *Examples*, let's first test the installation.

To do so simply run the following command:

```
orca_install_test
```

What's next?

Check out *Where to go from here?* for more info.

1.1.2 Where to go from here?

Check out the examples

A number of examples have been included in the source code to help you better understand how ORCA works and how you can use it. The examples are grouped based on the concepts they demonstrate. We also provide some examples for using 3rd party libraries together with ORCA.

Want to use ORCA in you project?

Check out the *Using ORCA in your projects* page for information on how to include the ORCA library into your next control project.

Check out the API Documentation

You can find the Doxygen generated API documentation at the following link: [API Documentation](#). This will help you navigate the ORCA API for your projects.

ROS or OROCOS user?

We have written ROS and OROCOS wrappers for the ORCA library and done most of the heavy lifting so you can get started using the contoller right away. To learn more about these projects please check out their respective pages:

ORCA_ROS: https://github.com/syroco/orca_ros



RTT_ORCA: https://github.com/syroco/rtt_orca (Compatible with ORCA < version 2.0.0)

1.1.3 Building the documentation

The ORCA documentation is composed of two parts. The **user's manual** (what you are currently reading) and the **API Reference**. Since ORCA is written entirely in `c++` the API documentation is generated with Doxygen. The manual, on the otherhand, is generated with python Sphinx... because frankly it is prettier.

Obviously, you can always visit the url: `insert_url_here`

to read the documentation online, but you can also generate it locally easily thanks to the magical powers of python.

How to build

First we need to install some dependencies for python and of course doxygen.

Python dependencies

```
pip3 install -U --user pip sphinx sphinx-autobuild recommonmark sphinx_rtd_theme
```

or if using Python 2.x

```
pip2 install -U --user pip sphinx sphinx-autobuild recommonmark sphinx_rtd_theme
```

Doxygen

You can always install Doxygen from source by following:

```
git clone https://github.com/doxygen/doxygen.git
cd doxygen
mkdir build
cd build
cmake -G "Unix Makefiles" ..
make
sudo make install
```

but we would recommend installing the binaries.

Linux:

```
sudo apt install doxygen
```

OSX:

```
brew install doxygen
```

Windows:

Download the executable file here: <http://www.stack.nl/~dimitri/doxygen/download.html> and follow the install wizard.

Building the docs with Sphinx

```
cd [orca_root]
cd docs/
make html
```

[orca_root] is the path to wherever you cloned the repo i.e. /home/\$USER/orca/.

How to browse

Since Sphinx builds static websites you can simply find the file docs/build/html/index.html and open it in a browser.

If you prefer to be a fancy-pants then you can launch a local web server by navigating to docs/ and running:

```
make livehtml
```

This method has the advantage of automatically refreshing when you make changes to the .rst files. You can browse the site at: <http://127.0.0.1:8000>.

1.1.4 Using ORCA in your projects

If you want to use ORCA in your project you can either use pure CMake or catkin.

CMake

```
# You need at least version 3.1 to use the modern CMake targets.
cmake_minimum_required(VERSION 3.1.0)

# Your project's name
project(my_super_orca_project)

# Tell CMake to find ORCA
find_package(orca REQUIRED)

# Add your executable(s) and/or library(ies) and their corresponding source files.
add_executable(${PROJECT_NAME} my_super_orca_project.cc)

# Point CMake to the ORCA targets.
target_link_libraries(${PROJECT_NAME} orca::orca)
```

catkin

Note: As of now, catkin does not support modern cmake targets and so you have some superfluous cmake steps to do when working with catkin workspaces.

```
# You need at least version 2.8.3 to use the modern CMake targets.
cmake_minimum_required(VERSION 2.8.3)

# Your project's name
project(my_super_orca_catkin_project)

# Tell CMake to find ORCA
find_package(orca REQUIRED)

# Tell catkin to find ORCA
find_package(catkin REQUIRED COMPONENTS orca)

# Include the catkin headers
include_directories(${catkin_INCLUDE_DIRS})

# Add your executable(s) and/or library(ies) and their corresponding source files.
add_executable(${PROJECT_NAME} my_super_orca_catkin_project.cc)

# Point CMake to the catkin and ORCA targets.
target_link_libraries(${PROJECT_NAME} ${catkin_LIBRARIES} orca::orca)
```

1.1.5 API Reference

All of the API documentation is autogenerated using Doxygen. Click the link below to be redirected.

API Documentation

1.1.6 Basic

1.1.7 Intermediate

1.1.8 Gazebo

1.1.9 Plotting

1.1.10 License

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Version 1.0 dated 2006-09-05.

Active maintenance and development ensured by Fuzzy Logic Robotics S.A.S.

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