mosaik-docker-jl Documentation

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Usage

A JupyterLab extension for executing co-simulations based on the mosaik framework and Docker.

CHAPTER 1

Usage

Find information about how to use the mosaik-docker JupyterLab package *here*.

1.1 Using the mosaik-docker JupyterLab extension

1.1.1 Overview

The *mosaik-docker JupyterLab extension* integrates package mosaik-docker into the interactive JupyterLab environment. This allows to use *mosaik-docker* in three possible ways:

1. *Use JupyterLab's graphical user interface*
2. *Use a JupyterLab Python notebook*
3. *Use a JupyterLab terminal*

An introduction to the *basic workflow* of package *mosaik-docker* can be found here.

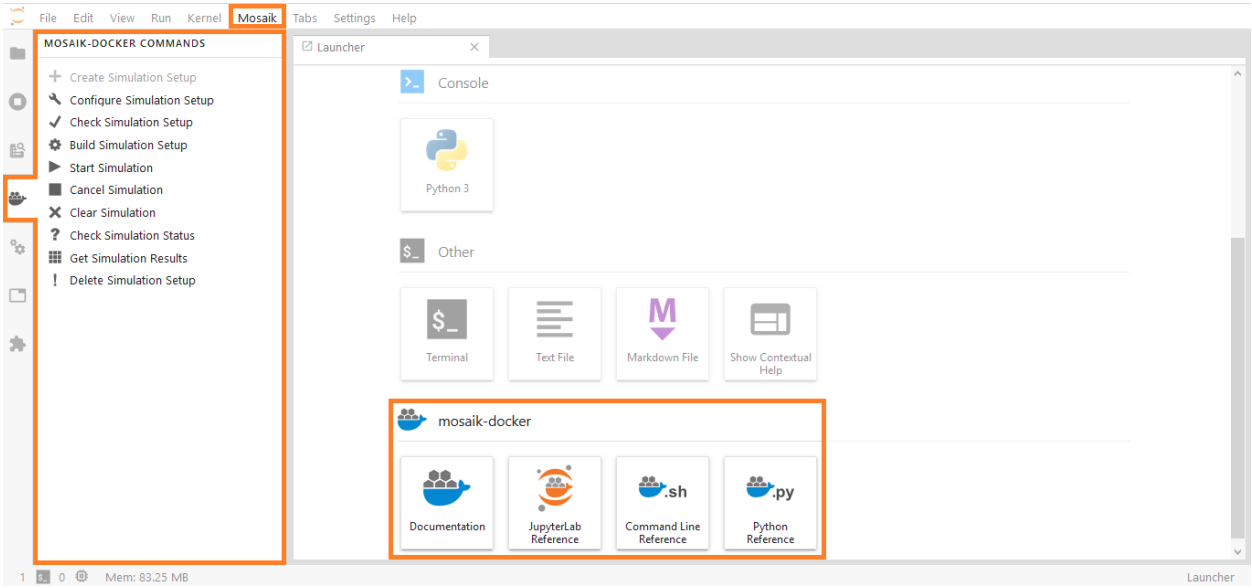
1.1.2 Use JupyterLab's graphical user interface

Basics

In JupyterLab, you can execute *mosaik-docker commands* in two ways:

- via a side tab to the left
- via a drop down menu in the menu bar on the top

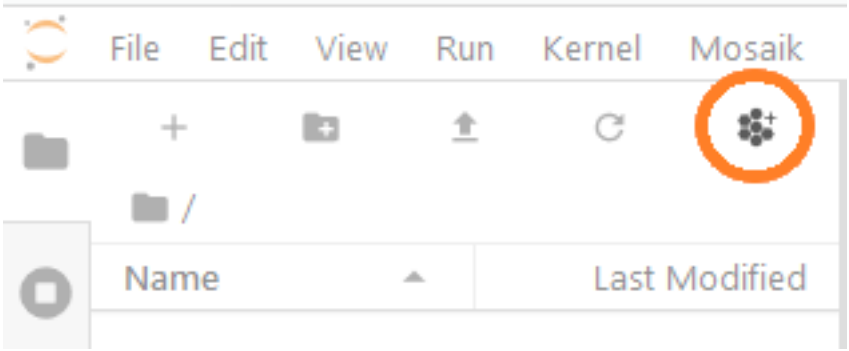
In addition, you can find links to the *mosaik-docker* documentation, this guide and other resources on bottom of the main Launcher tab.



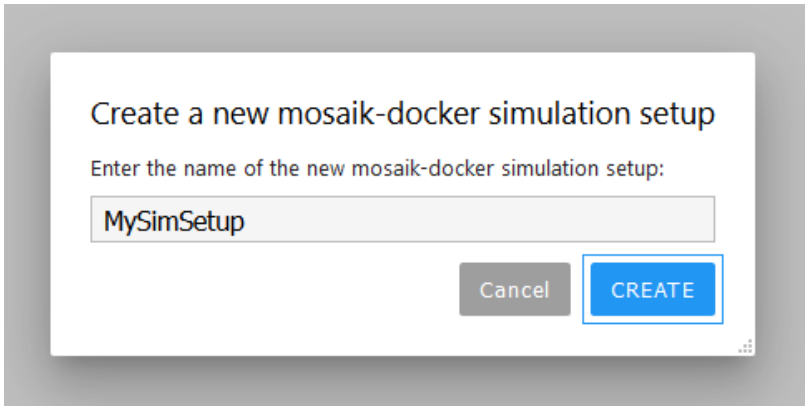
Create a simulation setup

A *simulation setup* is a directory that contains all necessary scripts and configuration files for a *mosaik-docker simulation*. You have several possibilities to create a new simulation setup:

- select command `Create Simulation Setup` from the side tab
- select command `Create Simulation Setup` from the drop-down menu
- use the dedicated button in JupyterLab's file browser (see image below)

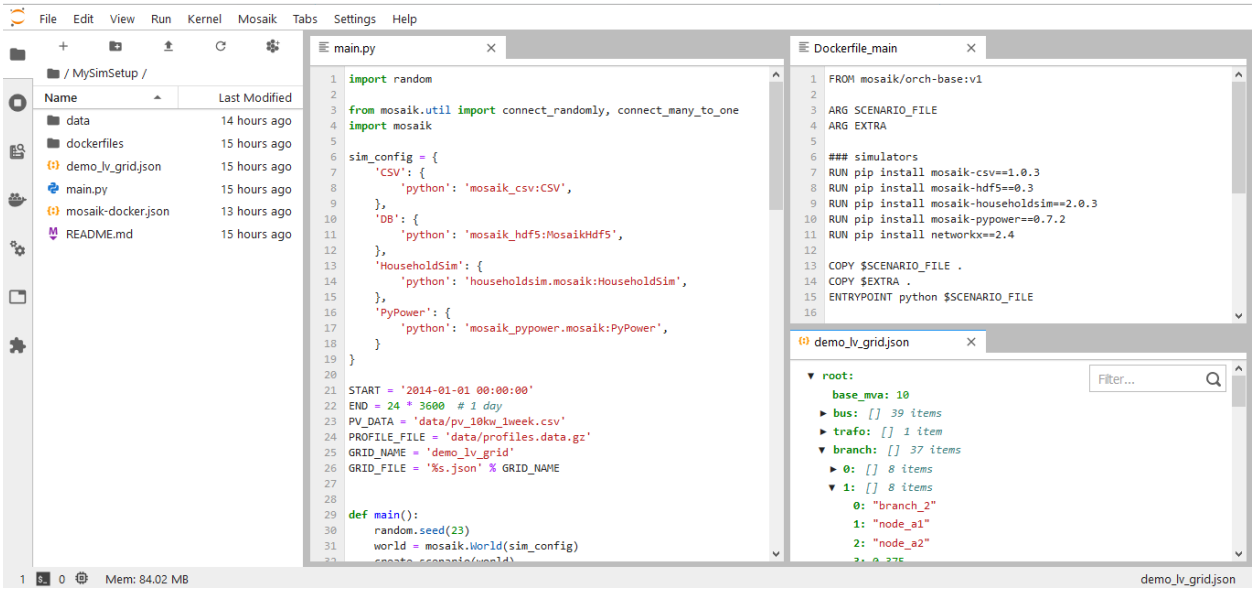


The new simulation setup will be created in the current working directory. To change the working directory, navigate to another directory in the JupyterLab file browser. When creating a new simulation setup you will be prompted for its name.



NOTE: It is not recommended to created nested simulation setups. Hence, the command to create a new simulation setup is greyed out in the side tab and the drop-down menu when your working directory is a simultion setup (or a sub-directory).

Apart from a *config file* (`mosaik-docker.json`) and a minimal *Dockerfile* for the *mosaik orchestrator* (`dockerfiles/Dockerfile_main`), the created simulation setup will be basicaly empty. To run a simulation, you need to add your own *simulation scenario file* and optionally some *data*. As a starting point you can use one of the *simulation setup examples* provided here. The JupyterLab environment is also well suited for developing the content of your own simulation setup, providing for instance an editor with syntax highlighting.



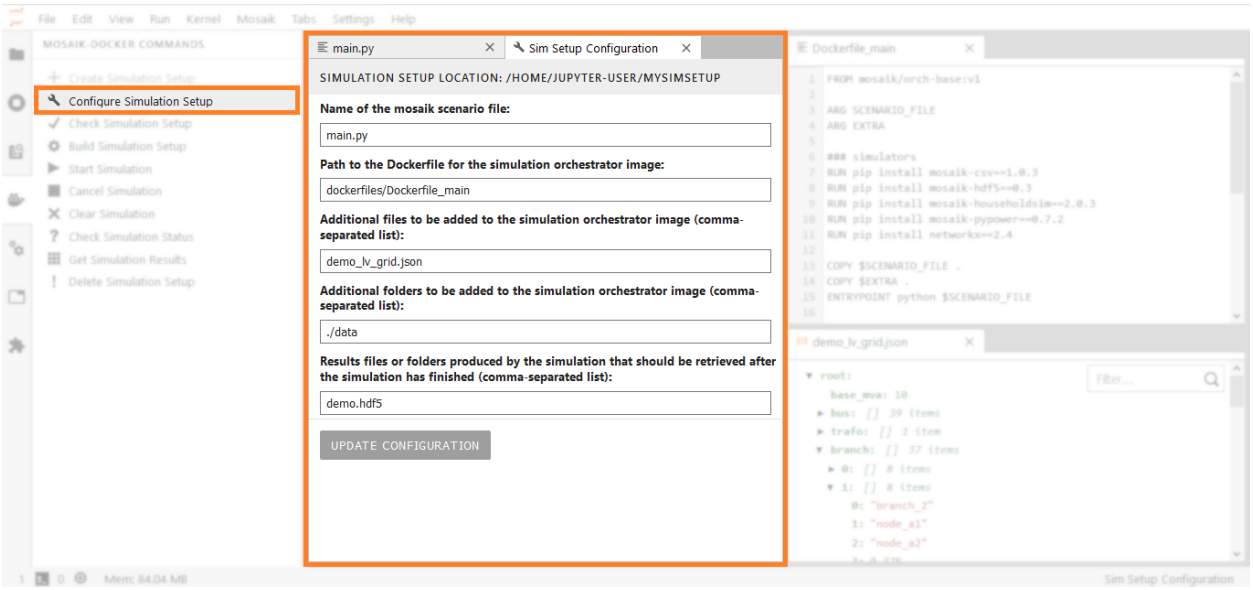
Configure simulation setup

The configuration for the simulation setup is stored in file `mosaik-docker.json`. It contains all relevant information for running a dockerized mosaik simulation It is highly recommended to NOT edit this configuration file by hand, but to use command `Configure Simulation Setup` from the side tab or the drop-down menu. This will bring up a new tab, in which the following configuration items can be edited (all paths either relative to simulation setup directory or absolute):

- path to mosaik scenario file
- path to Dockerfile for mosaik sim manager
- input files and/or folders (optional)

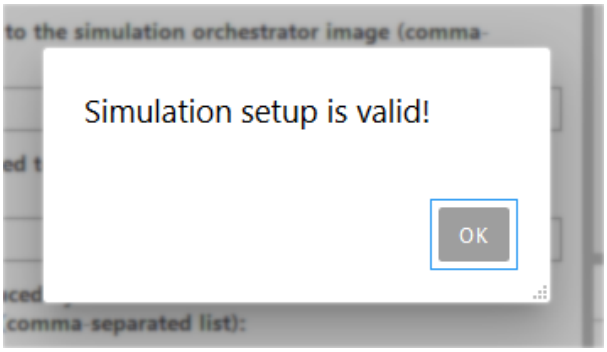
- output files (optional)

Once you have provided all configuration items, you can save this information via the `UPDATE CONFIGURATION` button on the bottom right of the configuration tab.

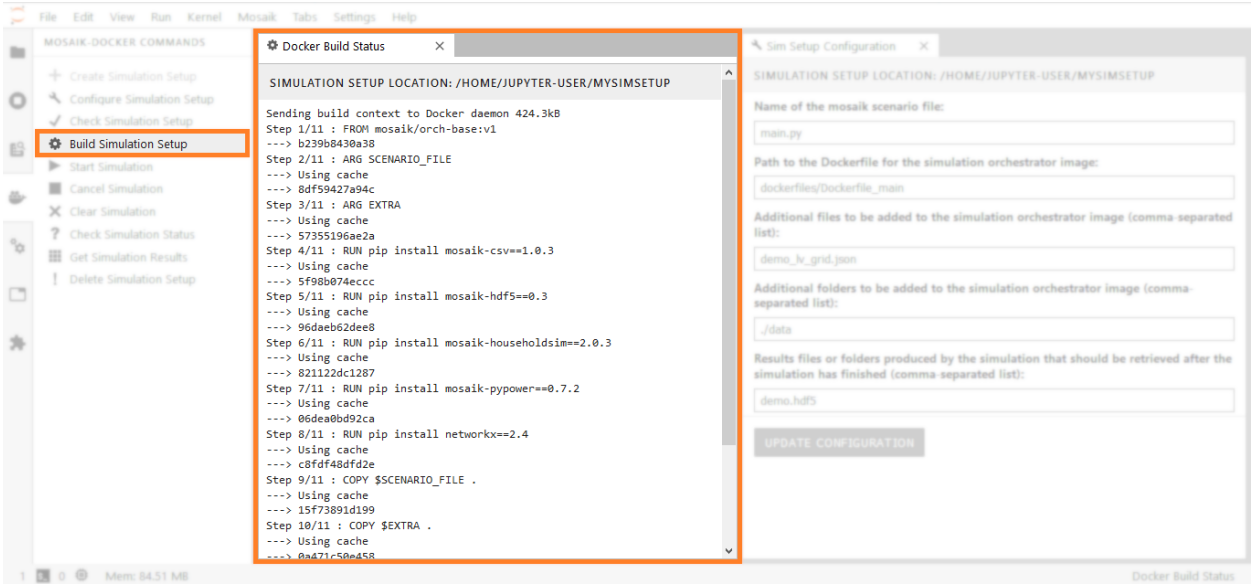


Check and build simulation setup

You can use command `Check Simulation Setup` to check if your simulation setup is valid.



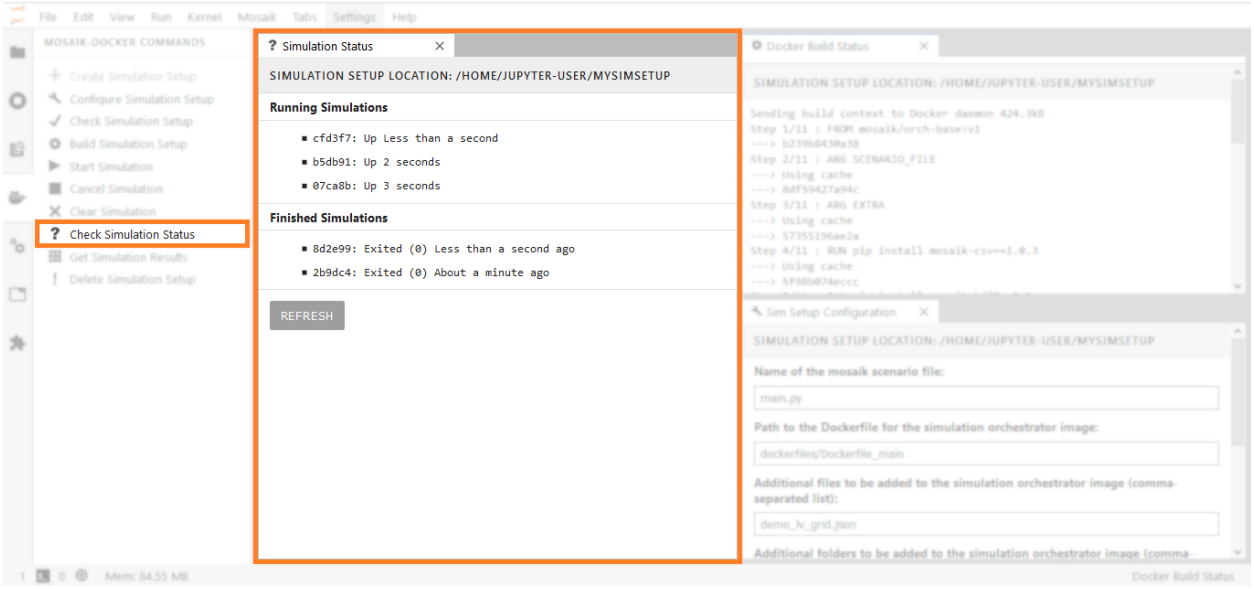
Once your setup seems to be fine, you can use command `Build Simulation Setup` to build the Docker images for running your simulation. This will bring up a new tab, on which you can see the output from the Docker image build process.



Run simulations and check their status

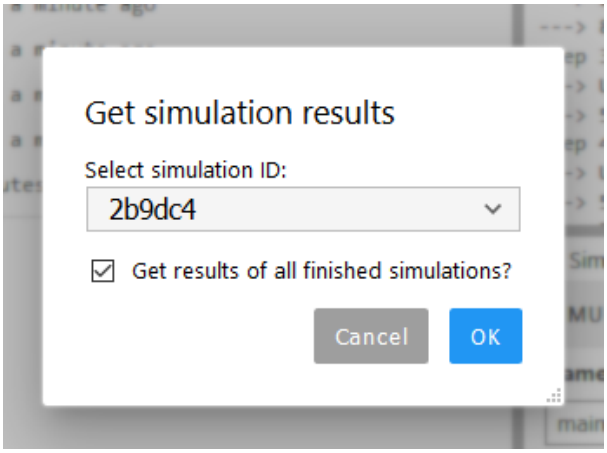
Once the Docker images have been successfully built, you can use command `Start Simulation` to start new simulation runs. Simulations are assigned an ID that allows to refer to them for monitoring and further interaction (get results, cancel, clear). Starting a new simulation will bring up a notification showing its ID.

Use command `Check Simulation Status` to check the status of your simulations. This will bring up a new tab listing the running and finished simulations (based on simulation IDs).

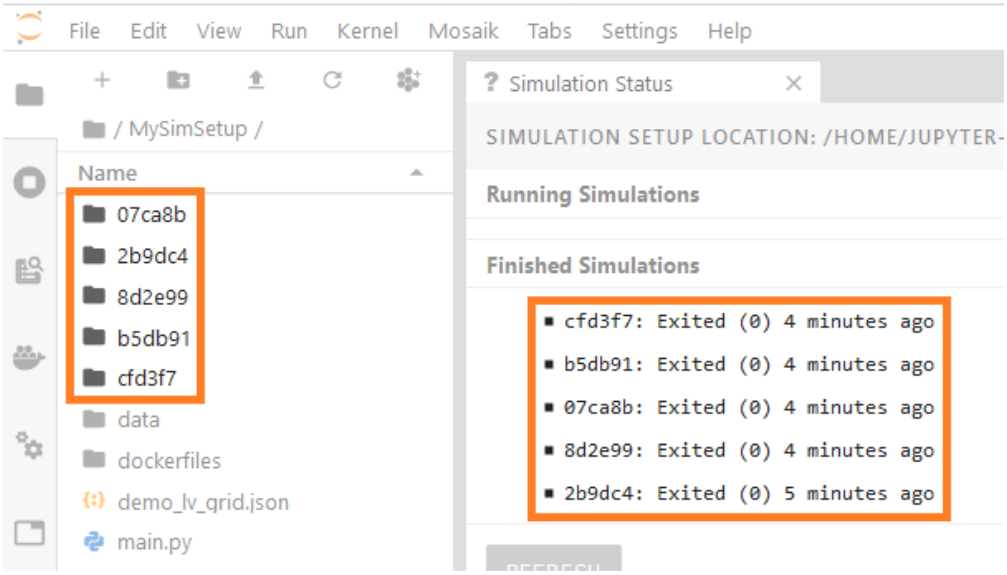


Retrieve simulation results

After a simulation has successfully finished, you can use command `Get Simulation Results` to retrieve the corresponding results. This will bring up a panel that lets you select to retrieve the results from either a specific simulation (drop down menu) or from all (checkbox).



For each selected simulation, the output files specified in the simulation setup configuration (see above) will be copied from the corresponding Docker container and copied to a sub-directory named according to the simulation ID.



1.1.3 Use a JupyterLab terminal

As an alternative to the GUI, you can use the *mosaik-docker* command line interface (CLI). Simply start a new terminal from JupyterLab's Launcher tab (see here for further details).

1.1.4 Use a JupyterLab Python notebook

As an alternative to the GUI and CLI, you can use the *mosaik-docker* Python API. This is especially usefull for automating your workflow. Simply start a new Python notebook from JupyterLab's Launcher tab and import package `mosaik_docker.cli` (see here for further details).

CHAPTER 2

Installation

This extension comprises:

- a Python package called `mosaik_docker_jl` for the server extension
- an NPM package called `mosaik-docker-jl` for the frontend extension.

Find information about the requirements and the installation of the mosaik-docker JupyterLab extension *here*.

2.1 Installing the mosaik-docker JupyterLab extension

2.1.1 Requirements

You will need Python (tested with version >= 3.6) and NodeJS to install the extension. For the extension to work properly, you will also need a working installation of Docker Engine.

2.1.2 Installation (standalone)

The package is available via the official Python Package Index. Install it from the command line:

```
pip install mosaik-docker-jl
jupyter lab build
```

2.1.3 Installation (JupyterHub)

JupyterHub distributions (e.g., The Littlest JupyterHub) already come with NodeJS installed. However, Docker Engine still needs to be installed from the JupyterHub administrator terminal using the `sudo -E`. From there, also the extension needs to be installed:

```
sudo -E pip install mosaik-docker-jl
sudo -E jupyter lab build
```

Each new JupyterHub user also has to be explicitly added to the group `docker`:

```
tljh-config add-item users.extra_user_groups.docker <user-name>
```

2.1.4 Troubleshoot

If you are seeing the frontend extension but it is not working, check that the server extension is enabled:

```
jupyter serverextension list
```

If the server extension is installed and enabled but you are not seeing the frontend, check the frontend is installed:

```
jupyter labextension list
```

If it is installed, try:

```
jupyter lab clean
jupyter lab build
```

In case you get error messages similar to the following one:

Check if the user has been added to group `docker`.

2.1.5 Development

Install

The `jlpm` command is JupyterLab's pinned version of yarn that is installed with JupyterLab. You may use `yarn` or `npm` in lieu of `jlpm` below.

```
# Clone the repo to your local environment
git clone https://github.com/ERIGrid2/mosaik-docker-jl.git
cd mosaik-docker-jl

# Install server extension
pip install -e .
# Register server extension
jupyter serverextension enable --py mosaik_docker_jl

# Install dependencies
jlpm
# Build Typescript source
jlpm build
# Link your development version of the extension with JupyterLab
jupyter labextension link .
# Rebuild Typescript source after making changes
jlpm build
# Rebuild JupyterLab after making any changes
jupyter lab build
```

You can watch the source directory and run JupyterLab in watch mode to watch for changes in the extension's source and automatically rebuild the extension and application.

```
# Watch the source directory in another terminal tab
jlpm watch
# Run jupyterlab in watch mode in one terminal tab
jupyter lab --watch
```

Uninstall

```
pip uninstall mosaik-docker-jl
jupyter labextension uninstall mosaik-docker-jl
    jupyter lab build
```