USER GUIDE

openlab.app

Version 4. April 2019

BEFORE YOU GET STARTED

The Web Enabled Drilling Simulator of OpenLab is based on IRIS's computer models of well flow and drillstring mechanics. With the Web Enabled Drilling Simulator, these computer models are made available through an intuitive interface. Although the computer models behind the simulator are among the world's most detailed models of their kind, we have tried to create an environment where you can easily run simulations and handle the results.

In this user guide we will try to guide you through the basics of the web enabled drilling simulator, and at the end of the user guide, there are some use cases that may help you to start using the simulator.

We hope you will find this document useful. For more information about OpenLab Drilling, you are welcome to find more information on openlab.app.

CONTENTS

1   INFORMATION AND LOGIN

The Web Enabled Drilling Simulator is accessible through live.openlab.app.

If you have not signed up already, and received a username and password, you may use a Google or Microsoft account. You will then be given a limited trial user account. Please contact us for any question regarding login and user account.

After logging in, you will be directed to the Home page which gives an overview of your configurations and simulations (if any). Here you can create, move and delete configurations. In the top right corner, you will find your personal settings and other user-specific information.

You can always go back to the Home page by clicking the OpenLab icon (the door) in the top left corner.

For the best experience, use a Google Chrome web browser. It will also run on Edge, Firefox and Safari, however some of the components might look strange or not work properly. You can use the Web Enabled Drilling Simulator at any screen size including a mobile device, however some functionality is hidden for smaller mobile sizes.

CONFIGURATION

2 CONFIGURATION

The objective of the Web Enabled Drilling Simulator is to run simulations. However, to create a simulation, you need to have a configuration in place. It is important to understand that each simulation is based on a distinct configuration.

> **A configuration in the Web Enabled Drilling Simulator is a description of the different elements and components that affect the circulation system and drillstring mechanics.**

A configuration consists of hundreds of input parameters that are used by the computer models to calculate the well flow and drillstring behavior. When you change one or several of the input parameters in the configuration, it will affect the results when running a simulation.

In OpenLab we have tried to simplify the configuration process. The computer models behind OpenLab Drilling are extremely advanced, and the variety of input parameters are huge. It can be difficult for the user to know the exact value of each input parameter for all the elements and components. Therefore, you are given a set of template configurations to start with. To create your specific configuration, you can simply start from one of the existing templates and modify it. To avoid any unphysical configurations, and to avoid any input parameters that are outside the acceptable range of the computer model, a set of validation rules need to be satisfied. When changing a configuration, you may therefore see an error message when the input parameters are invalid.

All configurations in OpenLab Drilling are based on a back-pressure Managed Pressure Drilling (MPD) setup. This does not mean that you need to use the MPD choke and back-pressure pump though. Simply leave the MPD choke open, and your configuration is similar to a conventional drilling operation with respect to circulation system and drillstring mechanics.

2.1 CREATE A NEW CONFIGURATION

A new configuration can be created from the Home page, or by editing any existing configuration. From the Home page you can create a new configuration based on a set of templates. These templates are examples of wells of different length and inclination. Please select the one you believe will best fit your planned well.


After pressing "New configuration" simply fill out the form. Your new configuration will then be visible on the Home page, or in one of your folders. It is also possible to mark some of your configurations as favorites. They will then appear at the top of the Home page under the Favorites heading.

2.2 EDIT A CONFIGURATION

Editing an existing configuration can be done from any of the edit pages (editors) in your configuration:

When editing a configuration, a set of validation rules will automatically be applied to secure that the configuration is still valid for the computer model to initialize and run. If one or several of the input parameters are outside the acceptable range, you will be given a warning along with a message. The message will guide you to the locations where the input parameters need to be corrected. If you want to go back to the last valid version, you can reload the page (press F5 on the keyboard or reload page on tablets), or click the "Reset all" button in the error message:
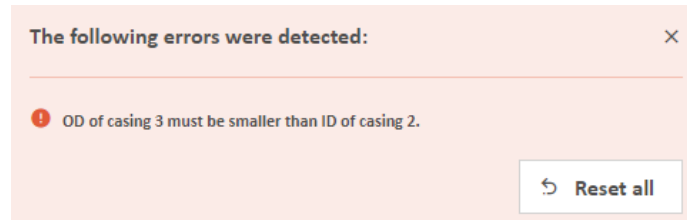
Be aware that if your configuration has already been used to create a simulation, any changes to the configuration will create a new version. Previous configurations along with corresponding simulations are stored and can be viewed in the Configuration sidebar, located as a pop-up menu on the right side of the edit pages.

2.2.1 Hole Section

In the Hole Section editor, you can edit lengths and diameters of the riser, casings, liners and open hole section. Just click on any element on the figure, and you will see the table in which you can edit. It is not possible to import any data for this editor, so you must edit manually. In this editor you can easily get validation errors. If you edit e.g. an inner diameter (ID) that does not allow any other casings to be run inside, you will be given a warning. You will be given warnings that are related to this editor, or it can be from other editors in the configuration that are affected. We hope that the error messages guide you to the right place for correcting errors in your configuration.

2.2.2 Wellpath

The front page of the Wellpath editor shows the trajectory of your well. The plot can be zoomed in/out with the mouse wheel scroll, rotated with left mouse click movements, and moved with right mouse click movements. The different colors on the trajectory refer to the dog leg severity (DLS). To edit the wellpath, push the Edit button:

For the Wellpath editor you have the possibility to import the survey points from a CSV file (see Chapter 6). You can edit manually as well, but beware that there are limitations on the dog leg severity (you will get an error message if the DLS is too high). Usually there are many survey stations, so the table is collapsed by default. To see all the stations, click the expand arrow, ⬉ , in the middle of the table.

2.2.3 Fluid

In the Fluid editor, you can edit two fluids, Fluid 1 and Fluid 2, by pressing the Edit button. Both fluids are based on templates which can be modified to your choice of mud. The density of the mud can also be changed during simulations, but the value you enter in the Fluid editor is your default value.

2.2.4 Drillstring

The drillstring, bottom hole assembly (BHA) and bit can be edited by clicking on each row. The BHA elements can be selected from a drop-down menu by clicking the + sign. Some elements in the BHA and drillstring also have some additional parameters that can be found by expanding the drop-down arrow in the lower right corner of its respective table row. This editor is also likely to give you

validation messages when you start editing. Hopefully the messages will guide you to the right locations to change your configuration into a valid configuration.

If you want to add along string measurement nodes to the drill string, you can enter the + button and choose ASM among the components. On the simulation graphs you will then be able to read the simulated pressure value from this sensor.
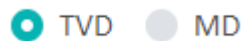
2.2.5 Geology
The geology editor contains three sub editors:

2.2.5.1 Geopressure
The geopressure profiles define the pore pressure and fracture pressure at any depth along the wellbore. You can list these profiles as functions of the True Vertical Depth (TVD) or as functions of the actual well-path Measured Depth (MD).

To edit the geopressure profile, click the Edit button. The profiles can be edited manually or by importing from a CSV file (see Chapter 6). Beware that when creating a new simulation, you are asked if you want to use the geopressure profiles as limits for the kick and loss simulations.

2.2.5.2 Geothermal
The geothermal profile is given as temperature gradient as a function of depth. This profile is used in the dynamic temperature calculations and to model e.g. the rheology and density of the drilling fluid at any depth of the well. To edit the geothermal gradient values, click on the Edit button. The profiles can be edited manually or by importing from a CSV file (see Chapter 6).

2.2.5.3 Formation
The formation strength is used in calculation of weight on bit (WOB) for a given rate of penetration (ROP). Formation strength is given by the unconfined compressive strength (UCS) as a function of depth. If no UCS values are entered, a default value of 100 is chosen in the simulation.

2.2.6 Rig
The Rig editor is where you can change input parameters for the different equipment that are affecting the fluid flow and drill string dynamics. When you hover over the figure, you can see which components are editable. Click on one of them (or click the Edit button) to open the input table to make any changes. Note that entering the traveling block weight is optional.

2.3 VERSIONING
Earlier versions of a configuration are stored and locked but can be used to generate new simulations. When a version is locked, it means that it has simulations associated to it, and therefore needs to be kept for reference. To keep track of the history of your configuration and the associated simulations, please navigate to the sidebar in your configuration view. You may need to expand this sidebar by pressing the expand button in order to see the versions. In the sidebar you can view earlier versions and create new simulations on them. However, if you want to edit an old (locked) version, you are asked to create a copy before you can edit. Locked configurations are indicated with a blue background color and a text field;
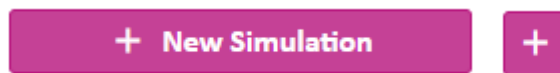
3 SIMULATION

A simulation in OpenLab can only be done after a configuration has been made. Every simulation is based on a distinct configuration. A simulation can be run from a web browser or from any other interface which can connect to the OpenLab web API (Chapter 6.3). This section is about simulations in the web browser. Later in this document we will guide you through the setup for simulations from Matlab and Python (Chapter 6).

3.1 CREATE A NEW SIMULATION

A new simulation can be created from the configuration view or from the simulations view by pushing the "New Simulation" button.

When creating a new simulation, you need to specify the name of your simulation and/or any advanced settings you would like. These advanced settings initialization parameters include the initial bit depth of your simulation, the initial top of string position, the auto connection time, and whether you want to be able to simulate influx/losses or not. If you choose "Based on geopressure", the geopressure curves (Chapter 2.2.6) will define your boundaries for influx and losses.

When creating a simulation, the computer model is first initialized and then (after a few seconds) ready to calculate the dynamic state of the well based on your choice of drilling parameters (setpoints).

3.2 DRILLING PARAMETERS (SETPOINTS)

In the current version you can control the following parameters:

- Main pump flow rate
- Hook speed
- ROP
- Surface RPM
- MPD Choke Opening
- MPD pump flow rate
- Density at inlet
- Pumped fluid
- BOP Choke Opening

These drilling parameters are setpoints, which means that they represent the desired or target value for the respective simulated process value. Both in OpenLab and in real life, there is a time-delay before the difference between the setpoint and process value is minimized, which is dependent on the characteristics of the component. To adjust the characteristics of a component, please see the Rig configuration editor.

The setpoints can be edited during the simulation in Manual mode, or they can be pre-selected and submitted to the computer model as a table of setpoints in the so-called Sequence mode.

Beware that the density of the fluid into the well (Density in) is typically not a drilling parameter which is possible to change "on the fly" in a real drilling operation. With today's equipment, you need to change the density by adjusting the content of weight material in the drilling fluid on the rig, which takes some time. However, in OpenLab we allow the users to change inlet density on the fly because it allows use of this parameter as a manipulated variable in process control simulations. The density given in the Fluid editor will still be your default density for this particular fluid, and the fluid that remains in the pit tank will have the default density. When you start a simulation, your well will always be filled with the fluid named as Fluid 1 in your Fluid editor. The "Density in" only allows you to change the density of the fluid that is being pumped into the well.

3.3 MANUAL MODE

In Manual mode you are free to change any of the setpoints during the simulation. In the current version of the simulator, we have set the length of a simulation step to one second. If you chose to run a simulation in "real time", ⊙, the simulation therefore performs one step per second. You can also run the simulator faster than real time, in the fast-forward mode, ▶▶. In fast forward, the speed of the simulation will depend on your computer device, internet connection, and number of simulation graphs.

A typical simulation speed is around 10x, which means 10 times faster than real time. In Manual mode each drilling parameter can be changed at any time, but be aware that in fast forward there might be some time-delay from when you enter a value until it is used in the simulations, since the simulator is running a few steps ahead of what is visible to you in the browser. If you want to simulate only one step ahead, you can do so by pushing the "Run a single step" button, ▐▶. When pausing a simulation, the simulation is temporarily put on hold and can be resumed at any time. If you do not resume a simulation within a certain time, or if you log out, the simulation is automatically stopped and completed by the system. This is to avoid too many ongoing simulations in the OpenLab system. If you push "Stop and complete a simulation" ■ , the simulation is saved and cannot be resumed. After a simulation has been completed, you can export the setpoints by clicking the "View setpoints" and then Export.

If you want to run through a pre-defined set of drilling parameters, you may use the Sequence mode. This will also result in a higher simulation speed.

Example on how to start drilling
Note 1: Very often the bit depth at the start of a simulation is slightly less than the initial bit depth you have entered when creating a simulation. This is because of the temperature model which calculates contraction/elongation of the drill string after you start a simulation.

Total well depth: 2500.00 m
Bit depth: 2499.50 m

To start drilling you need to apply weight on bit (WOB). Therefore, if the "Bit depth" is less than the "Total well depth" you need to place the bit on bottom by editing the Hook Speed (positive value is down, negative value is up).

Note 2: The ROP and the Hook Speed are setpoints for the same axial velocity of the drillstring. When bit is on bottom, the ROP setpoint will override a positive Hook Speed setpoint. If you enter a negative Hook Speed, the drillstring will be pulled up and ROP will no longer be used. The ROP setpoint is only used if, and only if, bit is on bottom.

Action 1: Set Hook speed to a positive value and press "run" or "fast-forward". You will then see that "Bit depth" is approaching "Total well depth". When they are identical you can apply weight on bit by using the "ROP" setpoint, but first you need to set a flow rate and rotate the drillstring.

Action 2: To drill you need to rotate the drillstring. Enter a value for the "Surface RPM", e.g. 120 rpm.

Action 3: To transport the cuttings you need to circulate drilling fluid. Enter a value for the "Main pump flow rate", e.g. 2000 l/min (530 gpm).

You are now ready to drill.

Action 4: Apply weight on bit by setting ROP to e.g. 20 m/h (65 ft/h).

You are now drilling in the OpenLab simulator. See Chapter 3.5 for how to view the results. To check that you are drilling you can e.g. open the graph "Cuttings transport" and see the simulated mass fraction of cuttings in suspension being transported in the annulus. If you do not have sufficiently flow rate and/or Surface RPM, cuttings will start to accumulate in cuttings bed(s) (open the graph "Cuttings bed" and check.)

More examples of using the simulator can be found in the Appendix.

3.4 SEQUENCE MODE

In Sequence mode you can either import a table of setpoints (see Chapter 4), or you can create a new sequence. When creating a new sequence, you need to specify the time of change for each parameter, as well as the total simulation time. When you have created a sequence, you can run the simulation by pushing run on the simulation page. This functionality is very nice if you want to run the identical set of setpoints on different configurations. You can then export your sequence and import it again after you have initialized a new simulation on a different configuration.

3.5 SIMULATION GRAPHS

The results can be viewed live via the simulation graphs. The results are presented as either time based series or depth based curves. The list of available graphs is found at the "Add/remove graphs" button, . After selecting your graphs of interest, you can drag and drop graphs to create your own view. Drop on the middle of a graph to swap the graphs, or drop a graph on the edge of a graph to shift the rest of the row or column over. Once you have found a graph view you like, you can save it by hitting the "Save graph selection" button, and the next time you enter a simulation, the graphs will display the current view.

3.6 AUTO CONNECTION

During drilling, as the drillstring moves down, the top of string gets to a point, generally around 1 meter above the drillfloor, where it needs to be replaced with a new drillstring section in order to continue drilling. This process involves closing the slips, shutting off the pumps and circulation, transferring a new drillstring section onto the old top of string, fastening this connection, restarting the pumps, and opening the slips again. In OpenLab, we simulate this procedure for you

automatically. You can specify the time this takes, or connection time, under the advanced settings when initializing a new simulation.

4 IMPORT AND EXPORT

Import and export of data to and from the Web Enabled Drilling Simulator is possible through a [CSV](#) format. When exporting data, a CSV file is created and downloaded to your computer. This CSV file can then e.g. be shared with others and used for import to run Sequence simulations. Export and import of CSV files is possible for some of the input parameters in some of the configuration editors, as well as the simulation setpoints. In addition, results can be exported after (or during) running a simulation.

4.1 CONFIGURATION DATA

Some of the configuration data are given in tables that potentially contain many rows. The current solution does not support cut and paste of rows and columns directly from e.g. Excel spreadsheets. Instead, you have the possibility to export and import tables in CSV format. The working steps are then:

1) Export the relevant table from OpenLab Drilling.
2) Load it into an Excel spreadsheet.
3) Do your editing in Excel, without changing the format.
4) Save as CSV from Excel.
5) Import the table to the relevant edit page in OpenLab.

Import and export of input parameters through the CSV format is currently available in the following edit pages:
● WELLPATH - For the survey stations.
● DRILLSTRING - For the elements in the Bottom Hole Assembly.
● FORMATION - For the geothermal and formation strength gradient.
● GEOPRESSURE - For pore- and fracture pressure gradients.

4.2 SIMULATION SETPOINTS

From the simulations you have the possibility to export both setpoints and results. Simulation setpoints can be exported after a simulation has been completed (stopped). You can export the setpoints by clicking "View setpoints". A list of all your setpoint values as a function of time during the simulation are then visible in a table, which can be exported.

4.3 SIMULATION RESULTS

Results from a simulation can be exported by clicking the download button, ⬇, in the top right corner of each simulation graph. You can do this during the simulation without pausing or stopping, or afterwards, from previous simulations. A list of graphs of results are available when clicking the "Add/remove graphs" button, 📈 .

5 TEAMS

Your username can be associated with multiple teams. If part of multiple teams, your configurations and simulations will be kept separate in the respective users team. To see your current active team

and the associated limits, click the user info button, 👤, in the top right corner of OpenLab and click "My Profile" from the dropdown.

5.1 INVITING SOMEONE TO A TEAM

With a paid plan, a team manager can invite several users to a team. To invite a user, click the "User administration" section found in the user settings, 👤, in the top right corner.
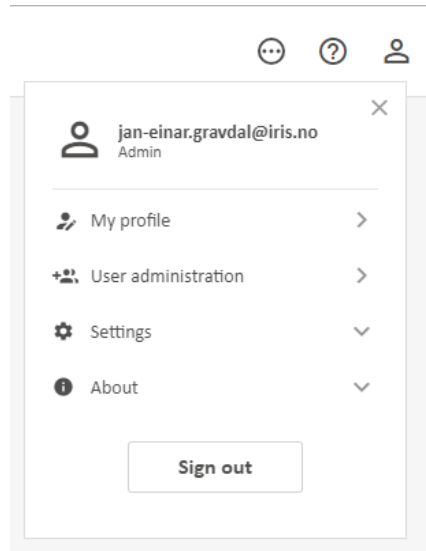
Afterwards, simply click on the "New user" button and decide which plan you want for the user. The main differences between the plans are maximum simulation time and capacity, which will be displayed when selecting the plan.

E-mail address

Invite user by e-mail...

Plan

New plan

Personal Plus ▾

Plan limits: **10** concurrent simulation(s)   **20 hours** simulation time

5.2 REMOVING A TEAM MEMBER

There are 2 ways a team manager can remove a user(s) from a team. Both of which start by navigating to the "User administration" section found in the user settings, 👤, in the top right corner.

Option 1) From the "User administration" section, click on the "Users" tab menu and select the edit user button, 🖉 . Click on the more settings button on the right side of the user, and an option to "Remove user from team" will appear. Click this to remove the team member.

Invitations

| Invited to the following teams	Role	Date	Invitation	
IRIS	Member	17.10.2018 13:28:52	✓ Accepted	···

Remove user from team
Set as manager

Option 2) Navigate to the team page also found in the "User administration" section. Click on the "Teams" tab and select the edit button, ✏️ , of the team you want to remove the user from. Next, click on the "Members" tab and find the user you want to remove. Click on the more settings button on the right side of the user, and an option to "Remove user from team" will appear. Click this to remove the team member.
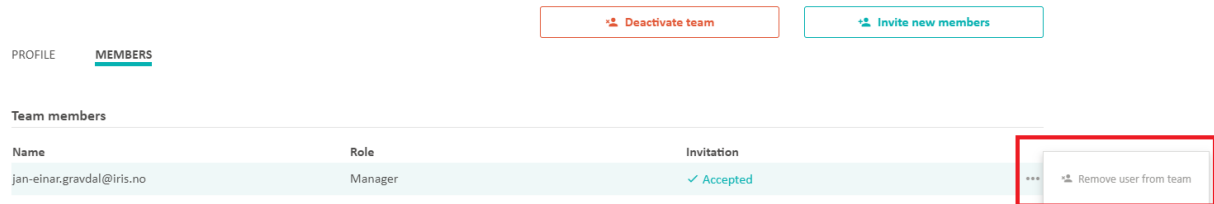
5.3 SWITCHING TEAMS

If you are part of multiple teams, you switch between them by either clicking the team name in the top-left corner of the home page, or by going to your user settings, 👤, in the top right corner and clicking "My Profile." This will switch all configurations and simulations to those associated with the current team, and your simulation capacity and length limits will be changed to reflect your active teams settings.

6 OTHER FEATURES

6.1 SHARE A CONFIGURATION AND A SIMULATION.

The configurations and simulations can be shared to anyone with an OpenLab user account. Each configuration has a unique configuration ID, and each simulation has a unique simulation ID. These ID's can be found in the URL of your browser. It will look something like this:

As you can see from the example URL, it contains a configuration ID, as well as a version ID (because there are multiple versions on this configuration), and there is a simulation ID associated with it. By clicking the "Share this page" button on the top right corner in OpenLab, ⋘ , you can copy this link to distribute it. Beware that when you share your configuration with others, the recipient needs to create their own copy to edit and run simulations. If you receive a shared configuration from someone you will see the following message in your OpenLab view:

6.2 CHANGE UNITS

By clicking the more settings button, ☺ , in the top right corner in OpenLab, you can select different unit systems.

7 MATLAB AND PYTHON INTERFACES TO THE WEB API

Any user with a user account in OpenLab can also reach the web API through clients other than a web browser. We have currently prepared templates for running the OpenLab Web Enabled Drilling Simulator from Matlab and from Python. These templates can be downloaded from our webpage.

To access OpenLab from Matlab or Python you need the API key. This key can be found under the Settings in ⌄ the User tab in the upper right corner in the web client:
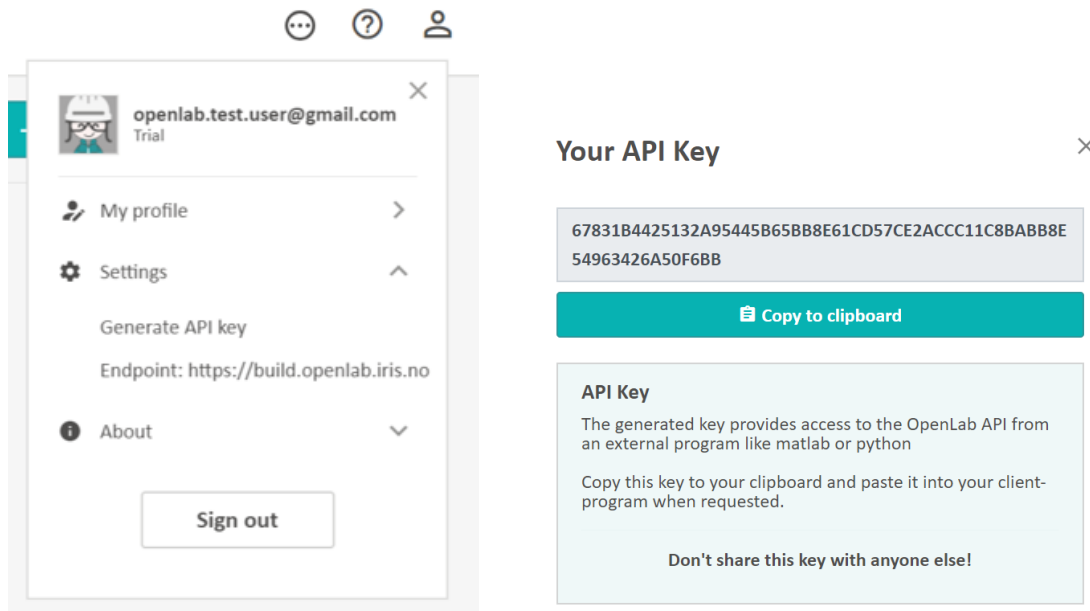
7.1 RUN A SIMULATION FROM MATLAB

NB: The Matlab client will only communicate with OpenLab if you are using Matlab version 2016b or later.

Stage 1) Download and unzip the Matlab.zip under Downloads from openlab.app/downloads

Stage 2) Open the file "GetLoginData.m".

-Edit the OpenLab username and API key and save the file.

Stage 3) Open one of the case files, e.g. "FlowSweep_BHPControl.m"

-Enter ConfigurationName. **Make sure this is an existing configuration that you have already created using the OpenLab web client.**

-You can specify a new SimulationName or use the default. This simulation name will be visible in the browser when you start a simulation from Matlab.

Stage 4) Run the case file, e.g. FlowSweep_BHPControl.m in Matlab. The results from the simulation will be visible in the browser under the corresponding configuration.

7.2 RUN A SIMULATION FROM PYTHON

Option 1) Install using Pip

Stage 1) Ensure you have Python 3.4+

Stage 2) Open up a command prompt

Stage 3) Run the command "pip install openlab"

Stage 4) Open a python script/shell and enter and execute the following lines

```
import openlab, os, inspect

example = "simTest.py"

openlab_path = os.path.dirname(openlab.__file__)

example_path = os.path.join(openlab_path, os.pardir, "examples", example)

exec(open(example_path).read())
```

Stage 5) Follow the command line prompts if there are any

Option 2) Install from zip

Stage 1) Download and unzip the Python.zip file under Downloads from openlab.app/downloads/.

Stage 2) Navigate to the unzipped folder.

Stage 3) Set-up user credentials before installation

-Open "openlab/credentials.py" with any text editor and enter your API key and associated e-mail address , both as strings, in the their respective variables.

-Save the file and close the text editor.

Stage 4) Installation

-From a command window navigate to the same unzipped folder as before and ensure that there is a file named "setup.py" located here.

-Enter the command `pip install .` to automatically install the package and necessary dependencies.

-Confirm the package installed correctly by entering the command 'pip show openlab' to see the package information.

Stage 5) Run a provided example simulation

-Open the file "examples/simTest.py"

-Change the config_name to the name of a configuration you have already created in the web client. **Make sure this is an existing configuration that you have already created using the OpenLab web client**.

-Save and close the file.

-Run the file how you would normally run any other python script.

7.3   THE SWAGGER API

OpenLab has a shared its API on https://live.openlab.app/swagger/. This documentation is currently under development.

8   JOYSTICK ENABLEMENT

You can connect a joystick to your computer and control your setpoints in a browser.

OpenLab currently supports the following joysticks:

- Logitech Extreme 3D Pro
- Logitech Attack 3

8.1   CONNECTING AND ENABLING JOYSTICK

To connect any of the supported joysticks (see Supported Joysticks section), simply plug it in to any USB port once you are logged in. You should get a joystick connected notification similar to the one below.

The supported joystick is automatically enabled once a simulation has been initialized and manual mode is selected.

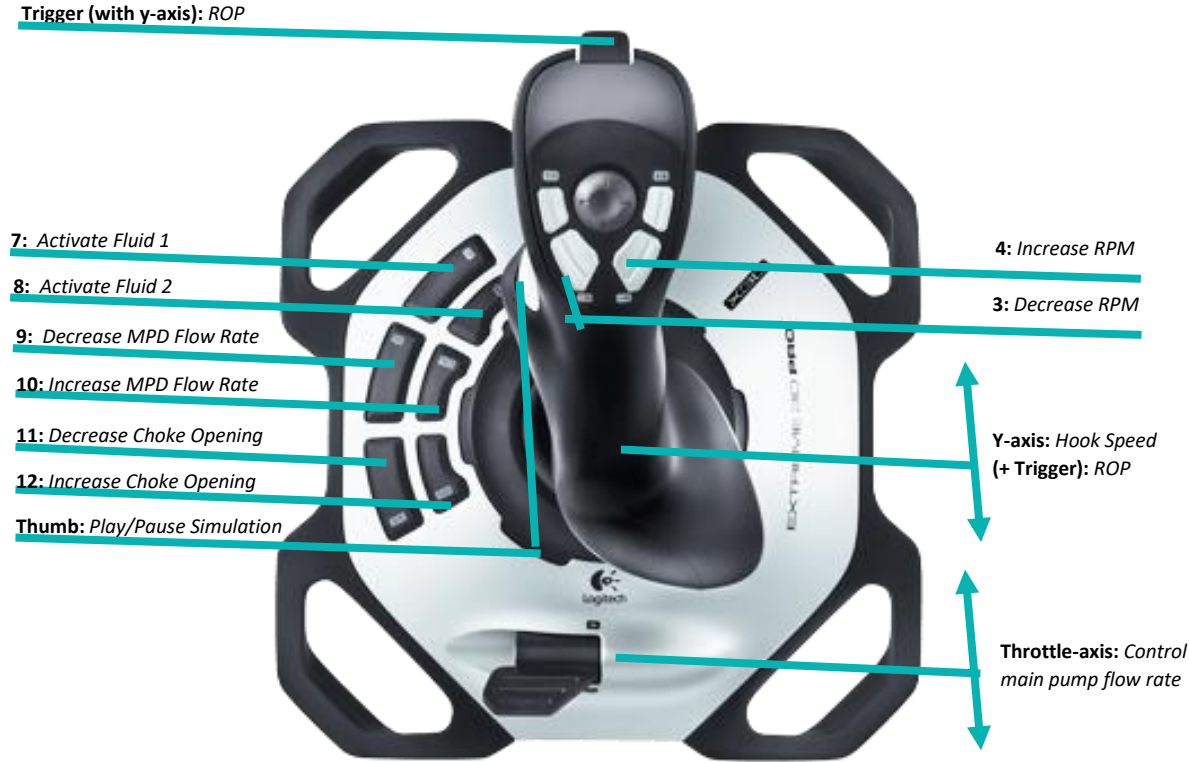Additionally, once a joystick has been enabled, a Joystick button should appear in the interactive sidebar. Clicking this will open your specific joysticks button mapping and controls (see Summary of Joystick Controls section).

If at any time, you wish to stop using the joystick, simply unplug the joystick. You will see a notification like the one below to confirm you have disconnected the joystick.

8.2 SUMMARY OF JOYSTICK CONTROLS

Logitech Extreme 3D Joystick Controls

Trigger (with y-axis): *ROP*

7: *Activate Fluid 1*

8: *Activate Fluid 2*

9: *Decrease MPD Flow Rate*

10: *Increase MPD Flow Rate*

11: *Decrease Choke Opening*

12: *Increase Choke Opening*

Thumb: *Play/Pause Simulation*

4: *Increase RPM*

3: *Decrease RPM*

Y-axis: *Hook Speed*
(+ Trigger): *ROP*

Throttle-axis: *Control main pump flow rate*

Photo Source

LOGITECH EXTREME 3D CONTROLS

BUTTON/AXIS	Function
THROTTLE-AXIS	Control the main pump flow rate
Y-AXIS	Top string velocity
Y-AXIS + TRIGGER	Incrementally adjust ROP setpoint
THUMB	Play/Pause Simulation
5 AND 6	Decrease and increase RPM
7	Activate fluid 1
8	Activate fluid 2
9 AND 10	Decrease and increase MPD flow rate
11 AND 12	Decrease and increase the choke opening

Logitech Attack 3 Joystick Controls

Trigger (with y-axis): *ROP*

3: *Play/Pause Simulation*

4: *Decrease RPM*

5: *Increase RPM*

11: *Increase Choke Opening*

6: *Activate Fluid 2*

Y-axis: *Hook Speed*
(+ Trigger): *ROP*

7: *Activate Fluid 1*

10: *Decrease Choke Opening*

8: *Decrease MPD Flow Rate*

9: *Increase MPD Flow Rate*

Throttle-axis: *Control main pump flow rate*
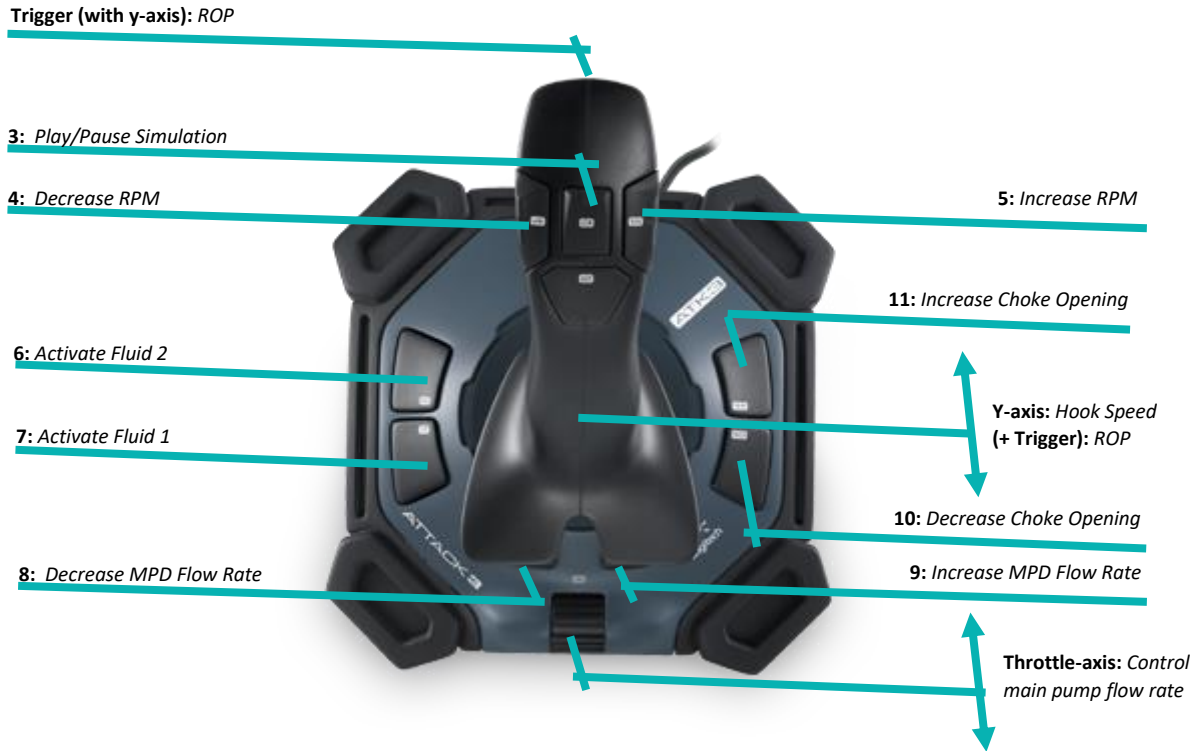
Photo Source

LOGITECH ATTACK 3 CONTROLS

BUTTON/AXIS	Function
THROTTLE-AXIS	Control the main pump flow rate
Y-AXIS	Top string velocity
Y-AXIS + TRIGGER	Incrementally adjust ROP setpoint
3	Play/Pause Simulation
4 AND 5	Decrease and increase RPM
6	Activate fluid 2
7	Activate fluid 1
8 AND 9	Decrease and increase MPD flow rate
10 AND 11	Decrease and increase the choke opening

8.3   CALIBRATION

Joystick calibration can be done to reset the 0 value, or neutral resting state, of the joysticks analog axes. To do this, an interactive simulation must be open with the supported joystick plugged in. Once open, click on the joystick "Controls" button located in the sidebar above the setpoints. A pop out should display showing the button controls, and at the bottom, a calibration button. Ensure the joystick is in the desired "rest state," and press this "Calibrate" button. A notification should display confirming calibration was performed.