SINTEF

SINTEF Virtual Lab (vLab)

User meeting 2023

Technology for a better society

What is the vLab?

Server Options

- **SHOP stable (15.4.0.1)**
  Latest stable version of SINTEF Energy's Short-term Hybrid Optimization Program. Python 3.11. Julia and R kernels. Based on jupyter/datascience-notebook. Visit https://shop.sintef.energy for more information, and to connect your vLab to our interactive documentation and examples.
- **SHOP latest (ba12dfd2)**
  Latest build of SHOP SINTEF Energy's Short-term Hybrid Optimization Program. Pre-release. Python 3.11. Julia and R kernels. Based on jupyter/datascience-notebook. Visit https://shop.sintef.energy for more information, and to connect your vLab to our interactive documentation and examples.
- **Temporarily static SHOP 15.3.4.0 on Jupyterlab v3 and Python 3.10**
  Version 15.3.4.0 of SHOP using Python 3.10 and Jupyterlab v3. Use this image if you need the git GUI, as it is not yet available in Jupyterlab v4.
- **ProdRisk 10.5.1 + SHOP 15.4.0.1**
  Python 3.11. Julia and R kernels. Based on jupyter/datascience-notebook. ProdRisk examples pre-deployed.

GitLab

DEV OPS

SHOP

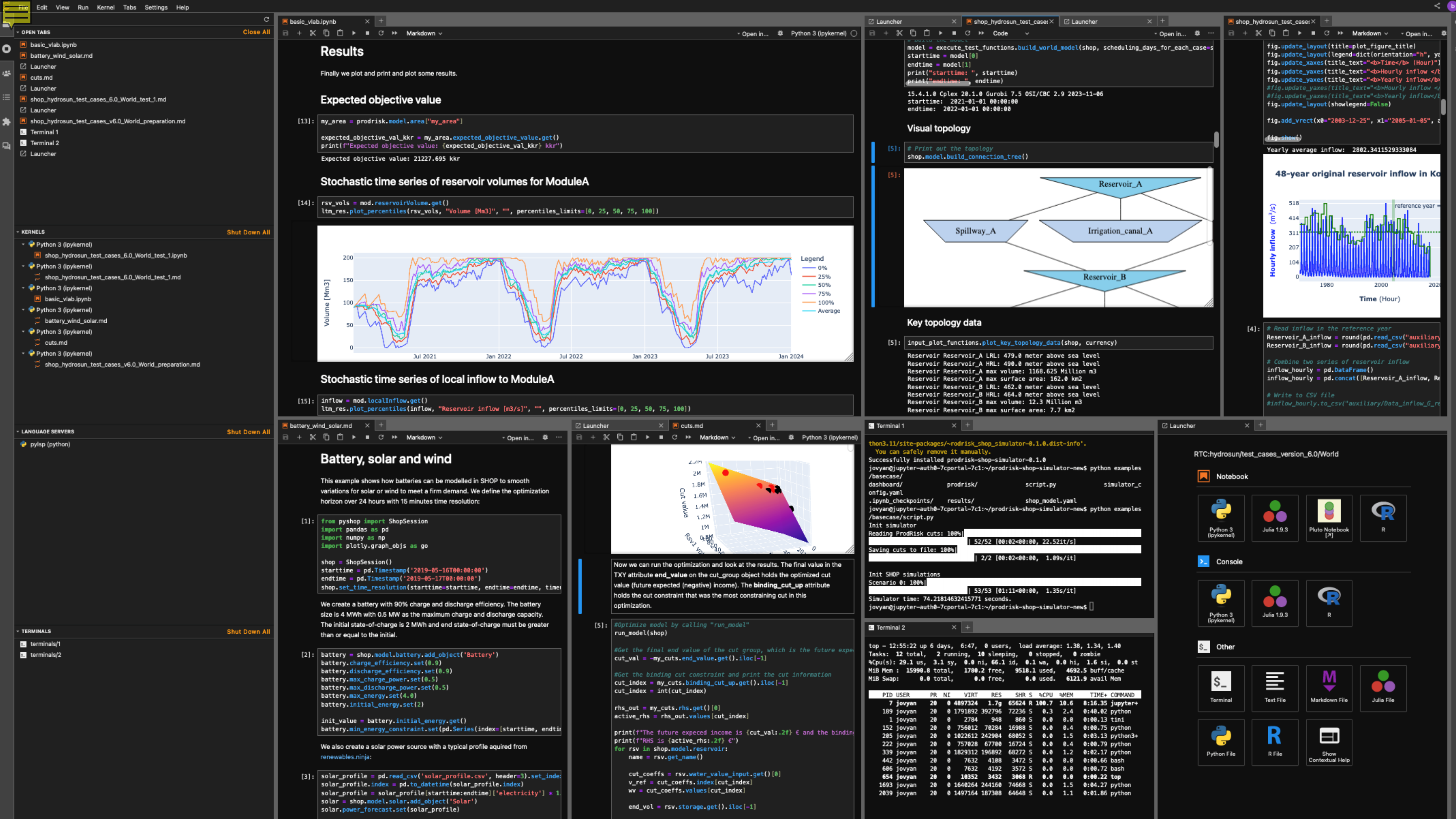
Latest files

- **SHOP 15.4.0.1** — 31.22 MB — 9 file(s)
- **SHOP 15.4.0.0** — 17.01 MB — 10 file(s)
- **SHOP 15.3.5.0** — 33.12 MB — 12 file(s)

ProdRisk

Latest files

- **Release 10.5.1** — 115.57 MB — 2 file(s)
- **ProdRisk 10.5.1 release candidate 2** — 113.67 MB — 2 file(s)
- **ProdRisk 10.5.1 release candidate** — 117.37 MB — 2 file(s)


File Edit View Run Kernel Tabs Settings Help
OPEN TABS Close All
basic_vlab.ipynb
battery_wind_solar.md
Launcher
cuts.md
Launcher
shop_hydrosun_test_cases_6.0_World_test_1.md
Launcher
shop_hydrosun_test_cases_v6.0_World_preparation.md
Terminal 1
Terminal 2
Launcher
KERNELS Shut Down All
Python 3 (ipykernel)
LANGUAGE SERVERS Shut Down All
pylsp (python)
TERMINALS Shut Down All
terminals/1
terminals/2
Results
Finally we plot and print and plot some results.
Expected objective value
my_area = prodrisk.model.area["my_area"]
expected_objective_val_kkr = my_area.expected_objective_value.get()
print(f"Expected objective value: {expected_objective_val_kkr} kkr")
Expected objective value: 21227.695 kkr
Stochastic time series of reservoir volumes for ModuleA
rsv_vols = mod.reservoirVolume.get()
ltm_res.plot_percentiles(rsv_vols, "Volume [Mm3]", "", percentiles_limits=[0, 25, 50, 75, 100])
Volume [Mm3]
Legend
0%
25%
50%
75%
100%
Average
Stochastic time series of local inflow to ModuleA
inflow = mod.localInflow.get()
ltm_res.plot_percentiles(inflow, "Reservoir inflow [m3/s]", "", percentiles_limits=[0, 25, 50, 75, 100])
15.4.1.0 Cplex 20.1.0 Gurobi 7.5 OSI/CBC 2.9 2023-11-06
starttime: 2021-01-01 00:00:00
endtime: 2022-01-01 00:00:00
Visual topology
# Print out the topology
shop.model.build_connection_tree()
Reservoir_A
Spillway_A
Irrigation_canal_A
Reservoir_B
Key topology data
input_plot_functions.plot_key_topology_data(shop, currency)
Reservoir Reservoir_A LRL: 479.0 meter above sea level
Reservoir Reservoir_A HRL: 490.0 meter above sea level
Reservoir Reservoir_A max volume: 1168.625 Million m3
Reservoir Reservoir_A max surface area: 162.0 km2
Reservoir Reservoir_B LRL: 462.0 meter above sea level
Reservoir Reservoir_B HRL: 464.0 meter above sea level
Reservoir Reservoir_B max volume: 12.3 Million m3
Reservoir Reservoir_B max surface area: 7.7 km2
Yearly average inflow: 2802.3411529333084
48-year original reservoir inflow in Ko
Hourly inflow (m3/s)
Time (Hour)
Read inflow in the reference year
Combine two series of reservoir inflow
Write to CSV file
Battery, solar and wind
This example shows how batteries can be modelled in SHOP to smooth variations for solar or wind to meet a firm demand. We define the optimization horizon over 24 hours with 15 minutes time resolution:
from pyshop import ShopSession
import pandas as pd
import numpy as np
import plotly.graph_objs as go
We create a battery with 90% charge and discharge efficiency. The battery size is 4 MWh with 0.5 MW as the maximum charge and discharge capacity. The initial state-of-charge is 2 MWh and end state-of-charge must be greater than or equal to the initial.
battery = shop.model.battery.add_object('Battery')
battery.charge_efficiency.set(0.9)
battery.discharge_efficiency.set(0.9)
battery.max_charge_power.set(0.5)
battery.max_discharge_power.set(0.5)
battery.max_energy.set(4.0)
battery.initial_energy.set(2)
We also create a solar power source with a typical profile aquired from renewables.ninja:
Now we can run the optimization and look at the results. The final value in the TXY attribute end_value on the cut_group object holds the optimized cut value (future expected (negative) income). The binding_cut_up attribute holds the cut constraint that was the most constraining cut in this optimization.
#Optimize model by calling "run_model"
run_model(shop)
Init simulator
Reading ProdRisk cuts: 100%
Saving cuts to file: 100%
Init SHOP simulations
Scenario 0: 100%
Simulator time: 74.21814632415771 seconds.
RTC:hydrosun/test_cases_version_6.0/World
Notebook
Python 3 (ipykernel)
Julia 1.9.3
Pluto Notebook
R
Console
Other
Terminal
Text File
Markdown File
Julia File
Python File
R File
Show Contextual Help

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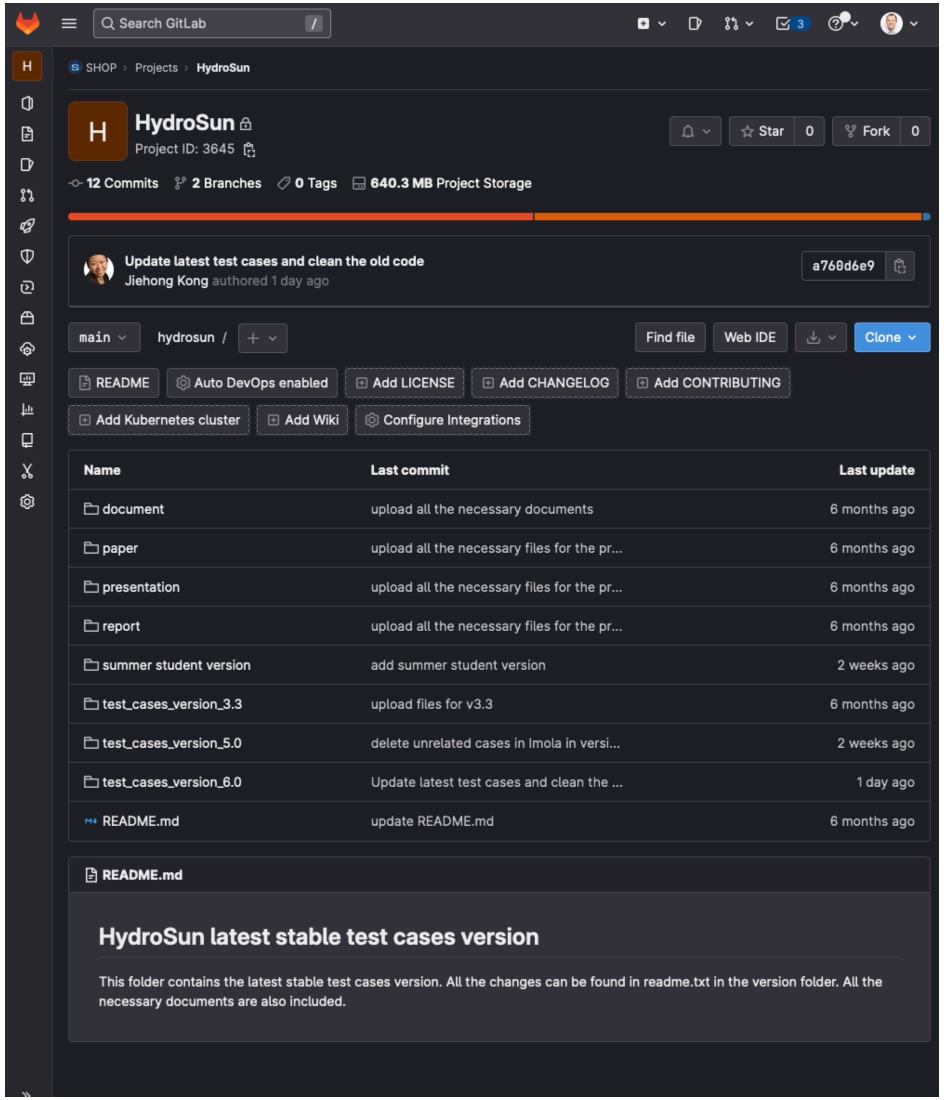
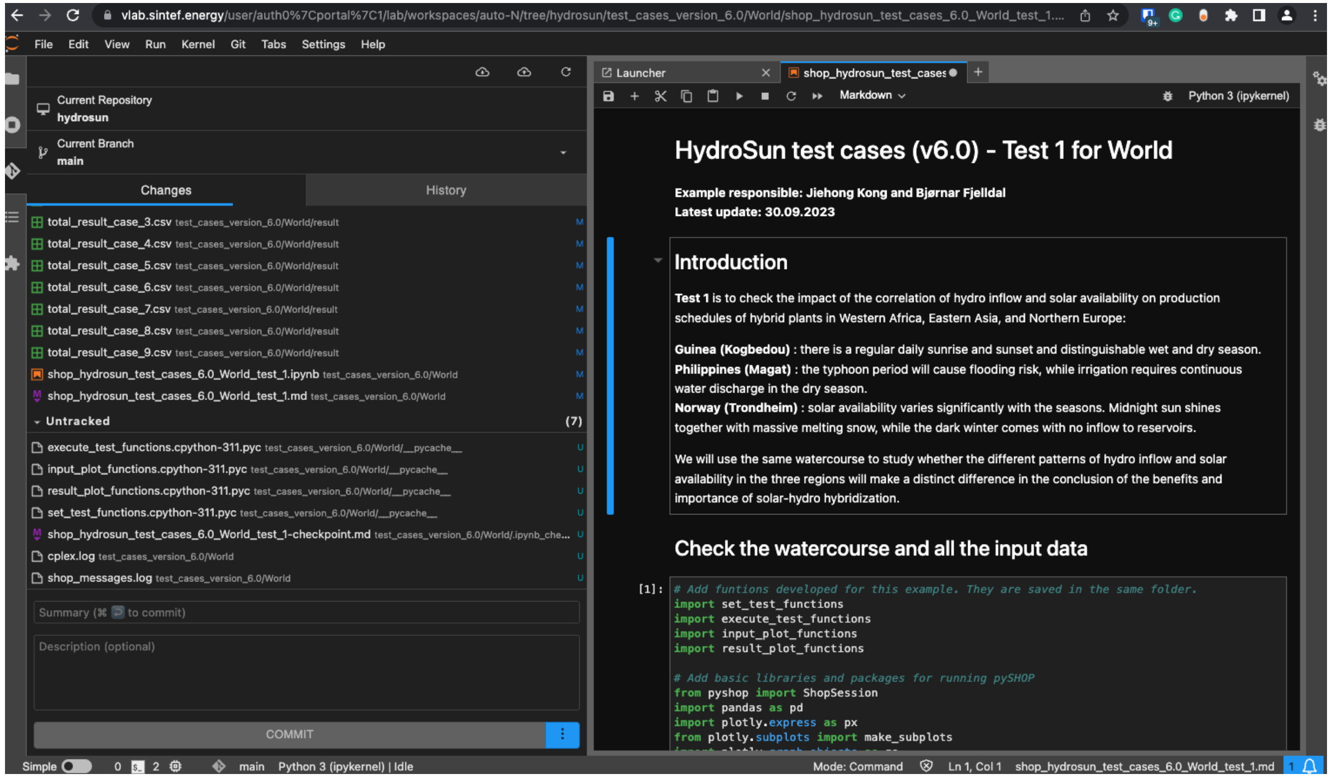
GitLab + vLab == True





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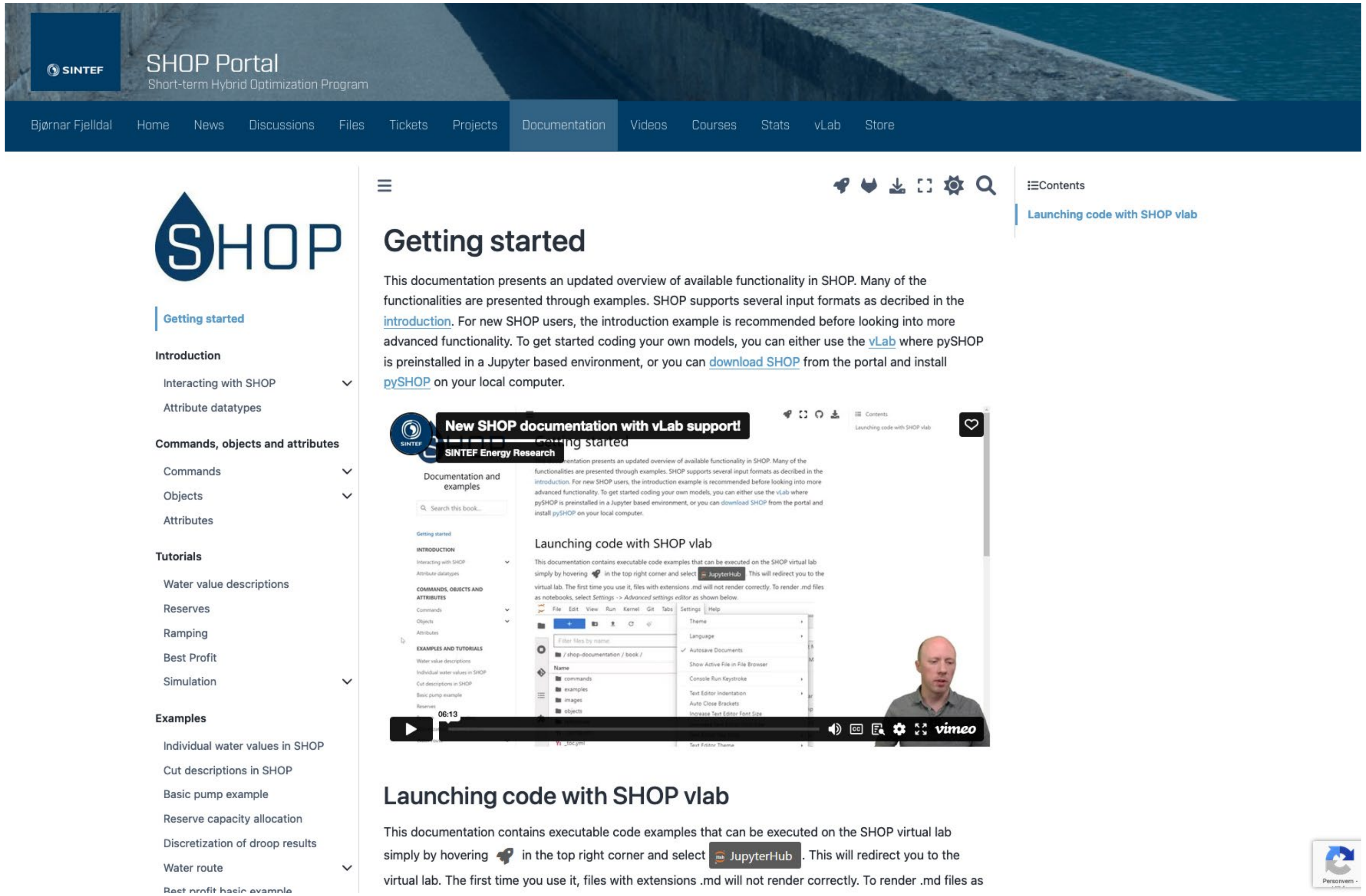
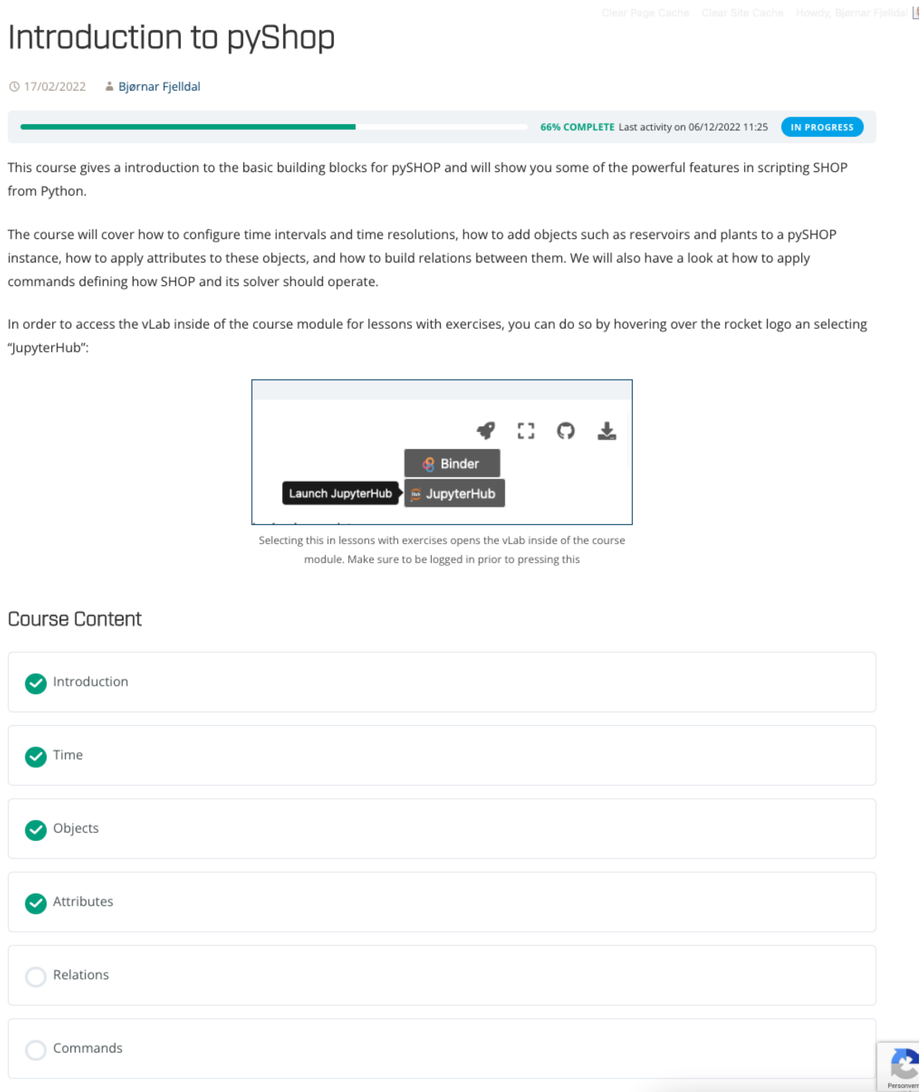
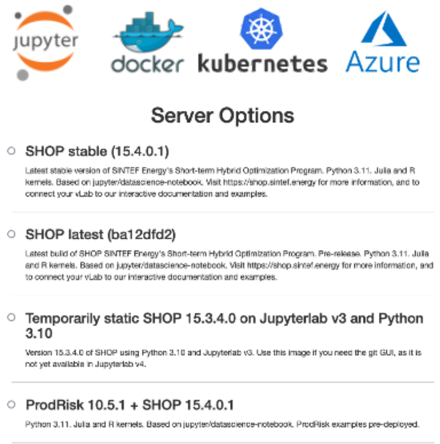
Integrated with documentation and courses

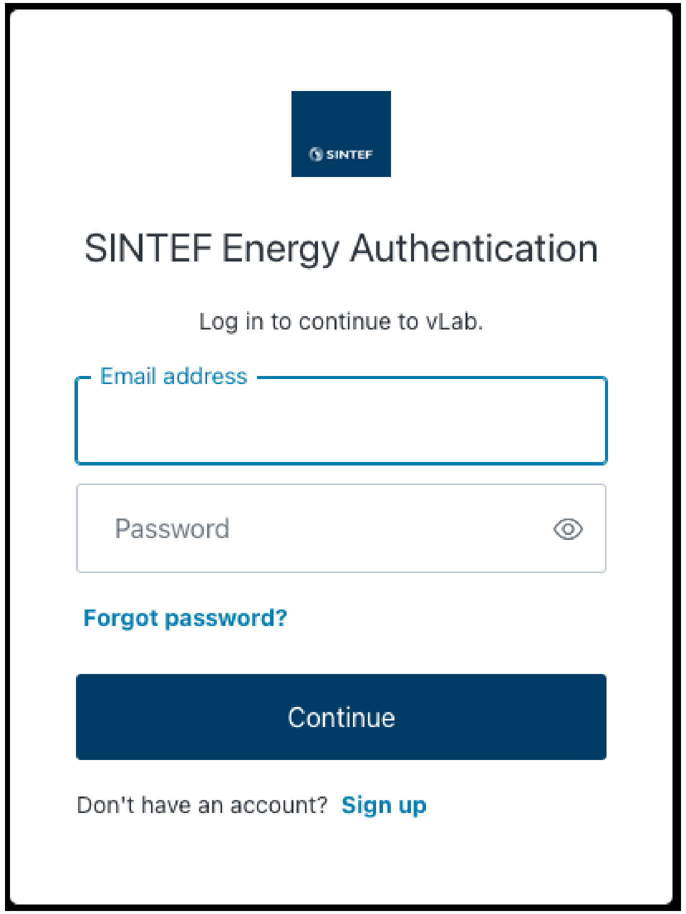


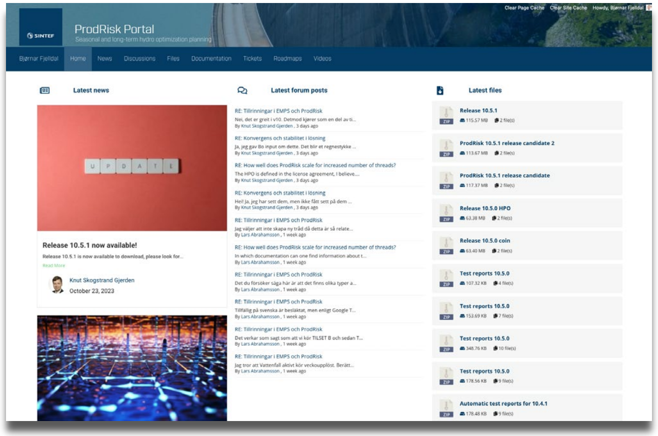


Single-sign-on (SSO)

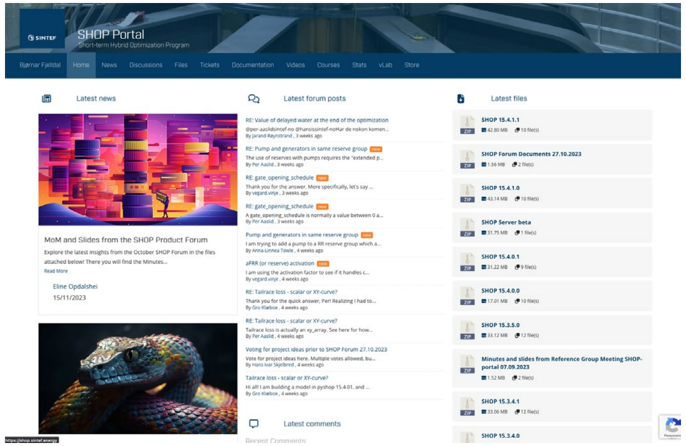


vlab.sintef.energy

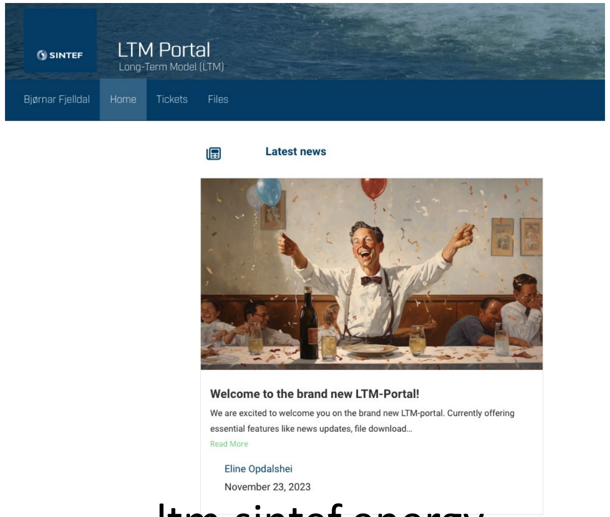




prodrisk.sintef.energy

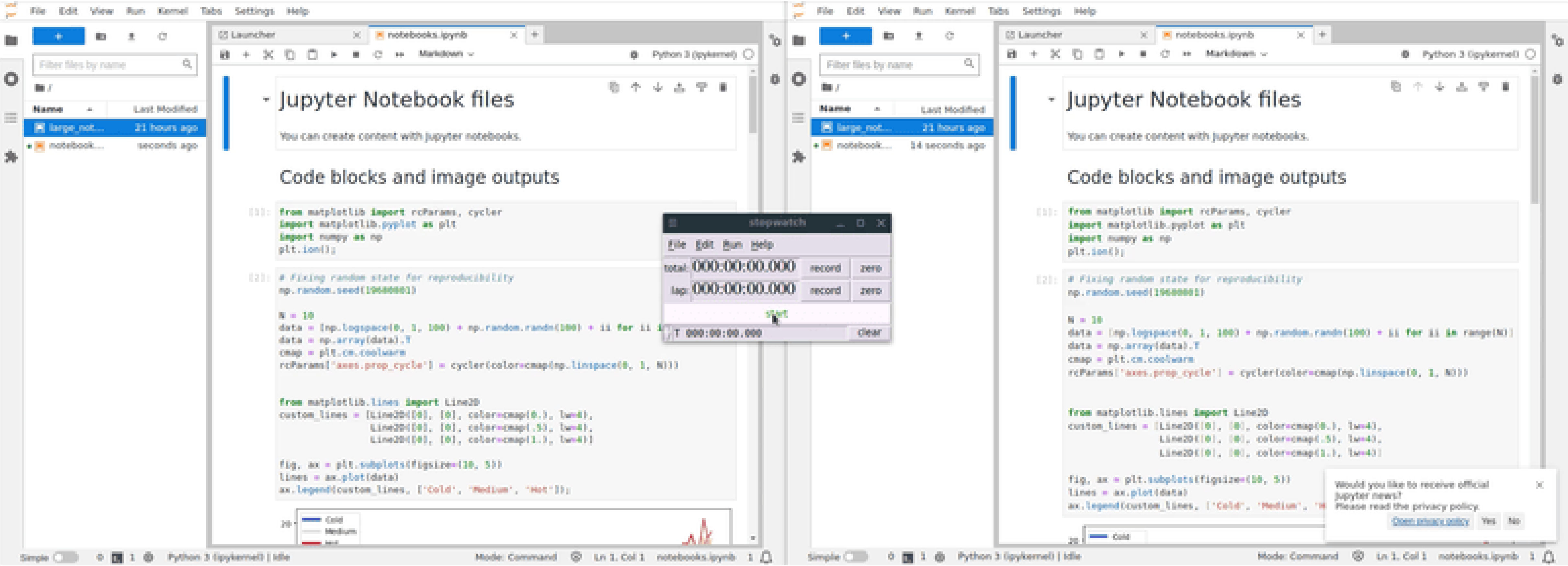


shop.sintef.energy

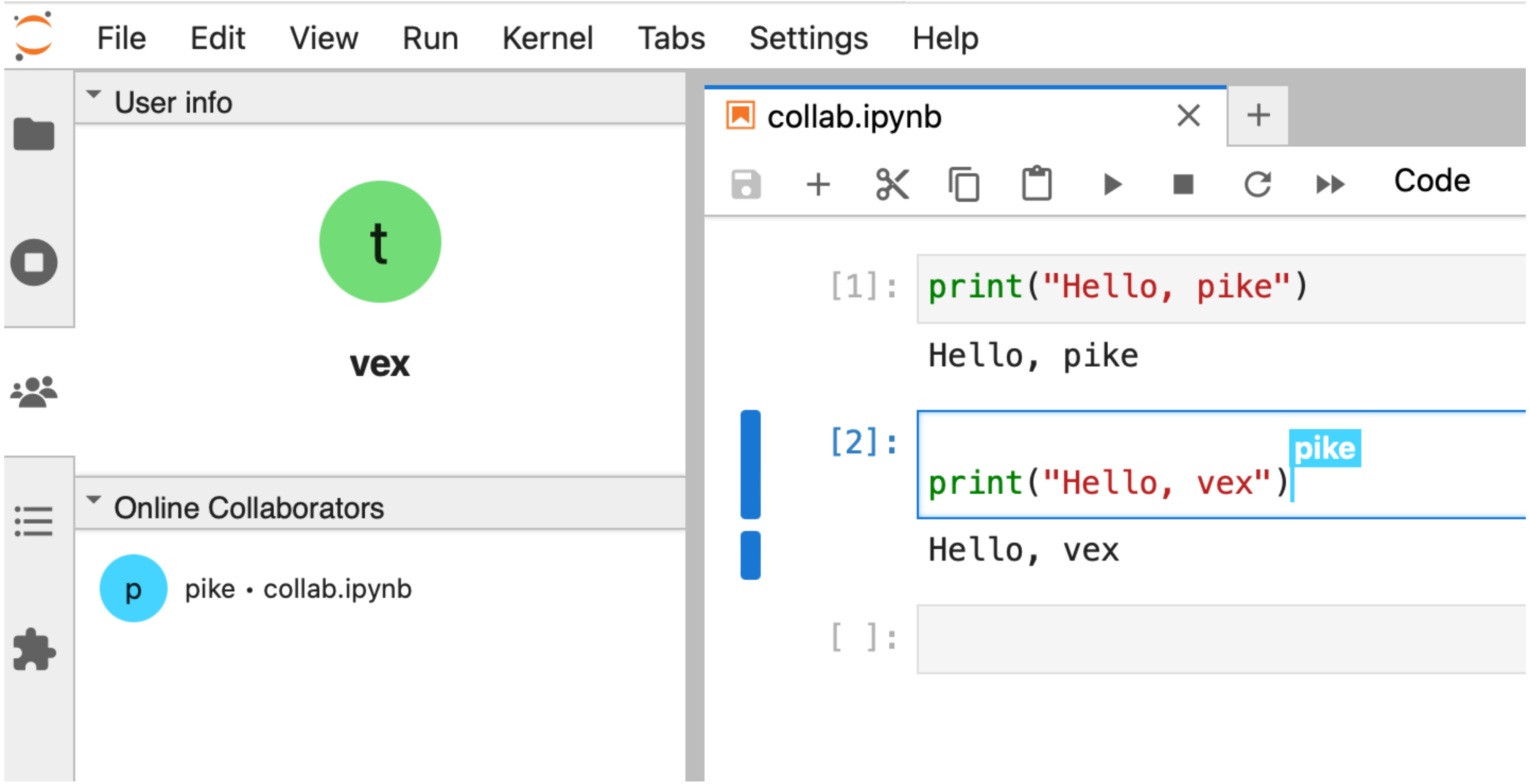


ltm.sintef.energy

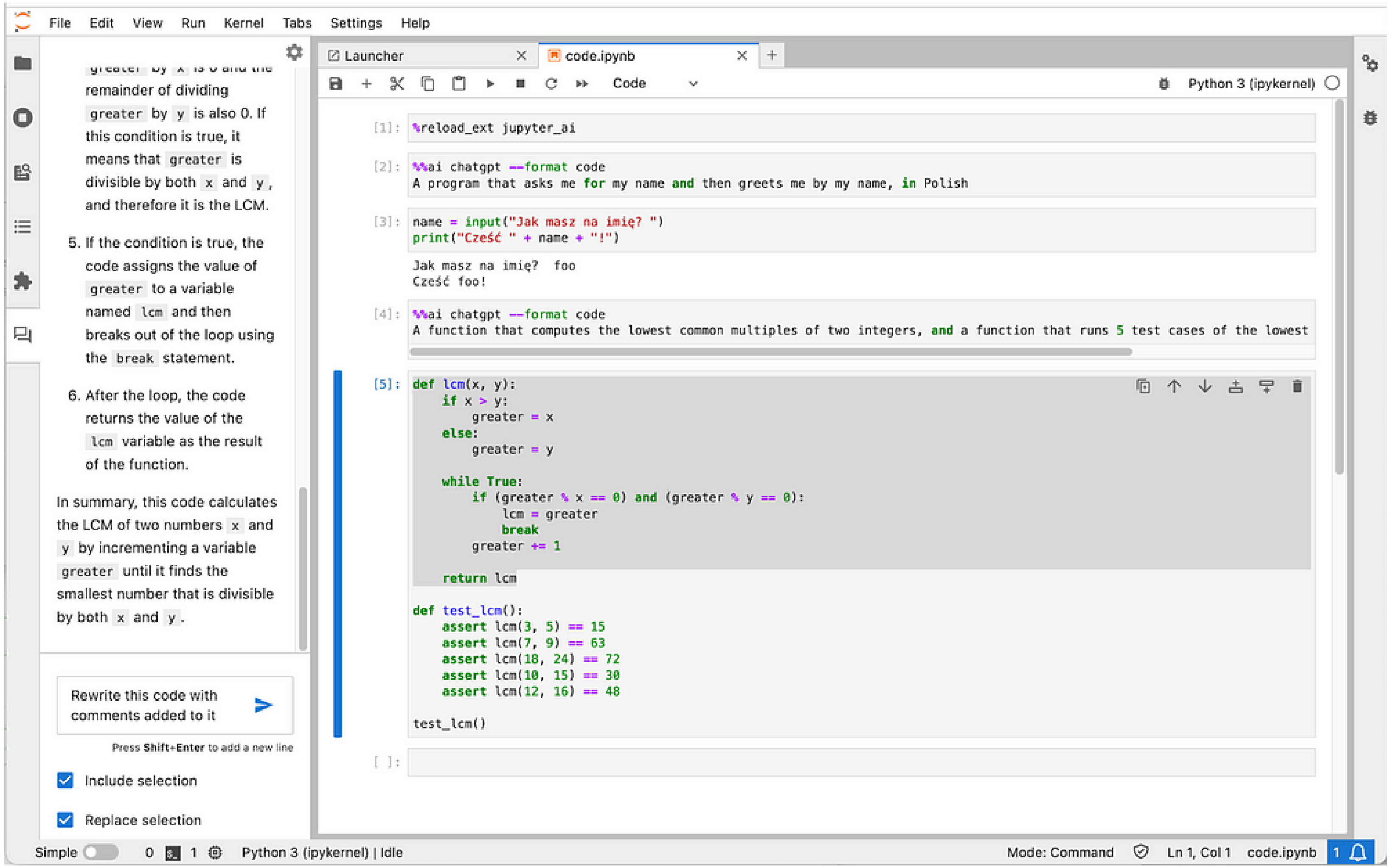
Significantly faster



Real-time collaboration / sharing



AI support (soon)



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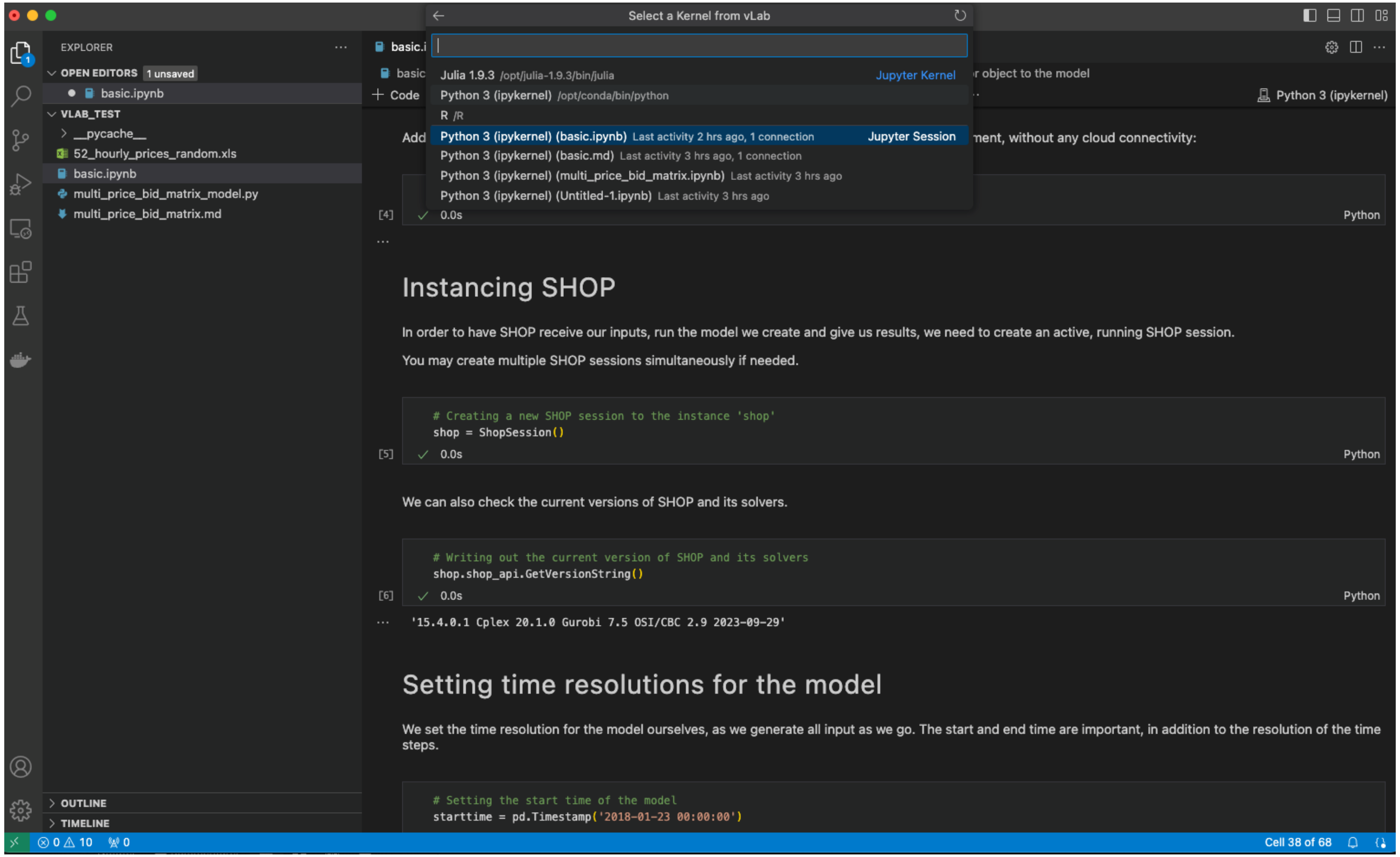
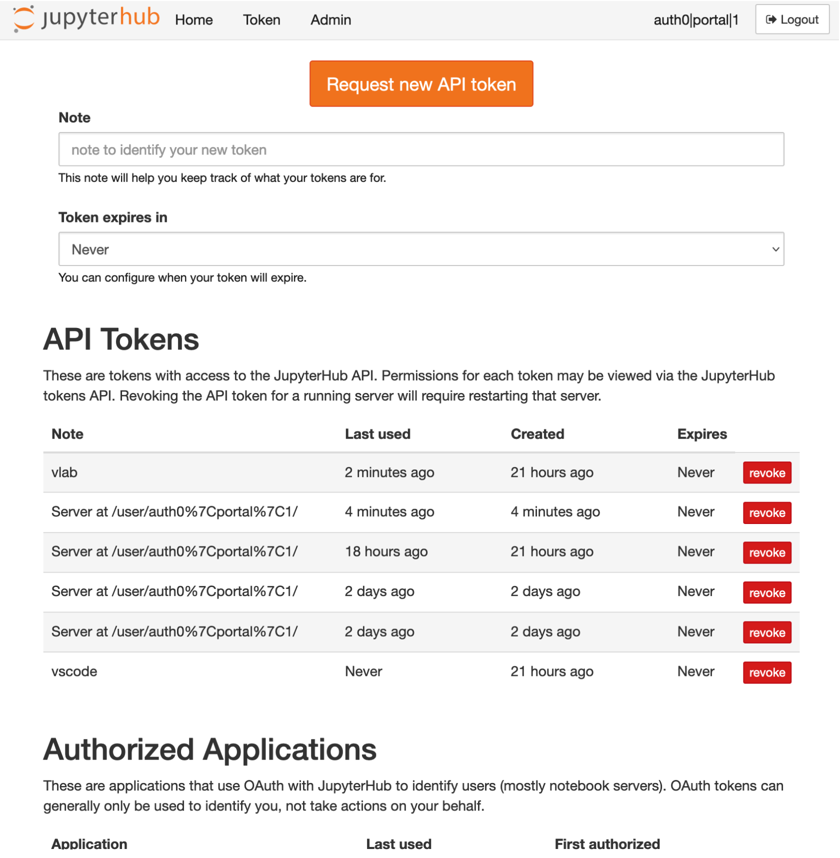
Use vLab in your local VS Code





Demo

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