

BPL_TEST2_Batch script with PyFMI

The key library PyFMI is installed.

After the installation a small application BPL_TEST2_Batch is loaded and run. You can continue with this example if you like.

```
In [1]: !lsb_release -a # Actual VM Ubuntu version used by Google
```

```
No LSB modules are available.  
Distributor ID: Ubuntu  
Description:    Ubuntu 22.04.4 LTS  
Release:        22.04  
Codename:       jammy
```

```
In [2]: %env PYTHONPATH=
```

```
env: PYTHONPATH=
```

```
In [3]: !python --version
```

```
Python 3.11.11
```

```
In [4]: !wget https://repo.anaconda.com/miniconda/Miniconda3-py311_24.11.1-0-Linux-x86_64.s  
!chmod +x Miniconda3-py311_24.11.1-0-Linux-x86_64.sh  
!bash ./Miniconda3-py311_24.11.1-0-Linux-x86_64.sh -b -f -p /usr/local  
import sys  
sys.path.append('/usr/local/lib/python3.11/site-packages/')
```

```
--2025-03-26 08:51:27-- https://repo.anaconda.com/miniconda/Miniconda3-py311_24.11.1-0-Linux-x86_64.sh
Resolving repo.anaconda.com (repo.anaconda.com)... 104.16.32.241, 104.16.191.158, 26
06:4700::6810:bf9e, ...
Connecting to repo.anaconda.com (repo.anaconda.com)|104.16.32.241|:443... connected.
HTTP request sent, awaiting response... 200 OK
Length: 145900576 (139M) [application/octet-stream]
Saving to: 'Miniconda3-py311_24.11.1-0-Linux-x86_64.sh'
```

```
Miniconda3-py311_24 100%[=====>] 139.14M  128MB/s   in 1.1s
```

```
2025-03-26 08:51:28 (128 MB/s) - 'Miniconda3-py311_24.11.1-0-Linux-x86_64.sh' saved
[145900576/145900576]
```

```
PREFIX=/usr/local
```

```
Unpacking payload ...
```

```
Installing base environment...
```

```
Preparing transaction: ...working... done
```

```
Executing transaction: ...working... done
```

```
installation finished.
```

```
In [5]: !conda update -n base -c defaults conda --yes
```

Channels:
- defaults
Platform: linux-64
Collecting package metadata (repodata.json): - 00\ 00| 00/ 00- 00\ 00| 00/ 00- 00\
00| 00/ 00- 00\ 00done
Solving environment: / 00- 00done

Package Plan

environment location: /usr/local

added / updated specs:
- conda

The following packages will be downloaded:

package	build	
-----	-----	
ca-certificates-2025.2.25	h06a4308_0	129 KB
certifi-2025.1.31	py311h06a4308_0	163 KB
openssl-3.0.16	h5eee18b_0	5.2 MB
-----	-----	
Total:		5.5 MB

The following packages will be UPDATED:

ca-certificates	2024.11.26-h06a4308_0 --> 2025.2.25-h06a4308_0
certifi	2024.8.30-py311h06a4308_0 --> 2025.1.31-py311h06a4308_0
openssl	3.0.15-h5eee18b_0 --> 3.0.16-h5eee18b_0

Downloading and Extracting Packages:

openssl-3.0.16	5.2 MB	: 0% 0/1 [00:00<?, ?it/s]
certifi-2025.1.31	163 KB	: 0% 0/1 [00:00<?, ?it/s]
ca-certificates-2025	129 KB	: 0% 0/1 [00:00<?, ?it/s]
ca-certificates-2025	129 KB	: 100% 1.0/1 [00:00<00:00, 11.07it/s]
certifi-2025.1.31	163 KB	: 79% 0.7872097632460872/1 [00:00<00:00, 7.75it/s]
openssl-3.0.16	5.2 MB	: 3% 0.02982593950162064/1 [00:00<00:03, 3.55s/it]
ca-certificates-2025	129 KB	: 100% 1.0/1 [00:00<00:00, 9.61it/s]
ca-certificates-2025	129 KB	: 100% 1.0/1 [00:00<00:00, 9.61it/s]

Preparing transaction: - 00done
Verifying transaction: | 00/ 00- 00done
Executing transaction: | 00done

```
In [6]: !conda --version  
!python --version
```

```
conda 24.11.1  
Python 3.11.11
```

```
In [7]: !conda config --set channel_priority strict
```

```
In [8]: !conda install -c conda-forge pyfmi --yes # Install the key package
```

```
Channels:
- conda-forge
- defaults
Platform: linux-64
Collecting package metadata (repodata.json): - 22\ 22| 22/ 22- 22\ 22| 22/ 22- 22\
22| 22/ 22- 22\ 22| 22/ 22- 22\ 22| 22/ 22- 22\ 22| 22/ 22- 22\ 22| 22/ 22- 22\ 22|
22/ 22- 22\ 22| 22/ 22- 22\ 22| 22/ 22- 22\ 22| 22/ 22- 22\ 22done
Solving environment: / 22- 22\ 22done
```

Package Plan

environment location: /usr/local

added / updated specs:

- pyfmi

The following packages will be downloaded:

package	build		
-----	-----		
_x86_64-microarch-level-3	2_broadwell	8 KB	conda-forge
assimulo-3.6.0	py311h083bc19_0	1.1 MB	conda-forge
certifi-2025.1.31	pyhd8ed1ab_0	159 KB	conda-forge
conda-25.1.1	py311h38be061_1	1.1 MB	conda-forge
fmilib-2.4.1	hac33072_1	383 KB	conda-forge
gmp-6.3.0	hac33072_2	449 KB	conda-forge
libamd-3.3.3	haaf9dc3_7100102	49 KB	conda-forge
libblas-3.9.0	31_h59b9bed_openblas	16 KB	conda-forge
libbtf-2.3.2	h32481e8_7100102	27 KB	conda-forge
libcamd-3.3.3	h32481e8_7100102	46 KB	conda-forge
libcbblas-3.9.0	31_he106b2a_openblas	16 KB	conda-forge
libccolamd-3.3.4	h32481e8_7100102	42 KB	conda-forge
libcholmod-5.3.1	h59ddab4_7100102	1.1 MB	conda-forge
libcolamd-3.3.4	h32481e8_7100102	33 KB	conda-forge
libcxsparse-4.4.1	h32481e8_7100102	118 KB	conda-forge
libgcc-14.2.0	h767d61c_2	828 KB	conda-forge
libgcc-ng-14.2.0	h69a702a_2	52 KB	conda-forge
libgfortran-14.2.0	h69a702a_2	52 KB	conda-forge
libgfortran-ng-14.2.0	h69a702a_2	53 KB	conda-forge
libgfortran5-14.2.0	hf1ad2bd_2	1.4 MB	conda-forge
libgomp-14.2.0	h767d61c_2	449 KB	conda-forge
libklu-2.3.5	hf24d653_7100102	142 KB	conda-forge
liblapack-3.9.0	31_h7ac8fdf_openblas	16 KB	conda-forge
libldl-3.3.2	h32481e8_7100102	24 KB	conda-forge
libopenblas-0.3.29	pthreads_h94d23a6_0	5.6 MB	conda-forge
libparu-1.0.0	h17147ab_7100102	91 KB	conda-forge
librbio-4.3.4	h32481e8_7100102	47 KB	conda-forge
libspex-3.2.3	had10066_7100102	79 KB	conda-forge
libspqr-4.3.4	h852d39f_7100102	213 KB	conda-forge
libstdcxx-14.2.0	h8f9b012_2	3.7 MB	conda-forge
libstdcxx-ng-14.2.0	h4852527_2	53 KB	conda-forge
libsuitesparseconfig-7.10.1	h92d6892_7100102	42 KB	conda-forge
libumfpack-6.3.5	heb53515_7100102	424 KB	conda-forge
metis-5.1.0	hd0bcaf9_1007	3.7 MB	conda-forge
mpfr-4.2.1	h90cbb55_3	620 KB	conda-forge

numpy-2.2.4	py311h5d046bc_0	8.6 MB	conda-forge
openssl-3.4.1	h7b32b05_0	2.8 MB	conda-forge
pyfmi-2.16.3	py311h9f3472d_0	5.2 MB	conda-forge
python_abi-3.11	2_cp311	5 KB	conda-forge
scipy-1.15.2	py311h8f841c2_0	16.4 MB	conda-forge
suitesparse-7.10.1	ha0f6916_7100102	12 KB	conda-forge
sundials-7.1.1	ha52427a_0	907 KB	conda-forge

Total:		56.1 MB	

The following NEW packages will be INSTALLED:

_x86_64-microarch~	conda-forge/noarch::_x86_64-microarch-level-3-2_broadwell
assimulo	conda-forge/linux-64::assimulo-3.6.0-py311h083bc19_0
fmilib	conda-forge/linux-64::fmilib-2.4.1-hac33072_1
gmp	conda-forge/linux-64::gmp-6.3.0-hac33072_2
libamd	conda-forge/linux-64::libamd-3.3.3-haaf9dc3_7100102
libblas	conda-forge/linux-64::libblas-3.9.0-31_h59b9bed_openblas
libbtf	conda-forge/linux-64::libbtf-2.3.2-h32481e8_7100102
libcamd	conda-forge/linux-64::libcamd-3.3.3-h32481e8_7100102
libcbblas	conda-forge/linux-64::libcbblas-3.9.0-31_he106b2a_openblas
libccolamd	conda-forge/linux-64::libccolamd-3.3.4-h32481e8_7100102
libcholmod	conda-forge/linux-64::libcholmod-5.3.1-h59ddab4_7100102
libcolamd	conda-forge/linux-64::libcolamd-3.3.4-h32481e8_7100102
libcxsparse	conda-forge/linux-64::libcxsparse-4.4.1-h32481e8_7100102
libgcc	conda-forge/linux-64::libgcc-14.2.0-h767d61c_2
libgfortran	conda-forge/linux-64::libgfortran-14.2.0-h69a702a_2
libgfortran-ng	conda-forge/linux-64::libgfortran-ng-14.2.0-h69a702a_2
libgfortran5	conda-forge/linux-64::libgfortran5-14.2.0-hf1ad2bd_2
libklu	conda-forge/linux-64::libklu-2.3.5-hf24d653_7100102
liblapack	conda-forge/linux-64::liblapack-3.9.0-31_h7ac8fdf_openblas
libldl	conda-forge/linux-64::libldl-3.3.2-h32481e8_7100102
libopenblas	conda-forge/linux-64::libopenblas-0.3.29-pthreads_h94d23a6_0
libparu	conda-forge/linux-64::libparu-1.0.0-h17147ab_7100102
librbio	conda-forge/linux-64::librbio-4.3.4-h32481e8_7100102
libspex	conda-forge/linux-64::libspex-3.2.3-had10066_7100102
libspqr	conda-forge/linux-64::libspqr-4.3.4-h852d39f_7100102
libstdcxx	conda-forge/linux-64::libstdcxx-14.2.0-h8f9b012_2
libsuitesparsecon~	conda-forge/linux-64::libsuitesparseconfig-7.10.1-h92d6892_7100102
libumfpack	conda-forge/linux-64::libumfpack-6.3.5-heb53515_7100102
metis	conda-forge/linux-64::metis-5.1.0-hd0bc9f9_1007
mpfr	conda-forge/linux-64::mpfr-4.2.1-h90cbb55_3
numpy	conda-forge/linux-64::numpy-2.2.4-py311h5d046bc_0
pyfmi	conda-forge/linux-64::pyfmi-2.16.3-py311h9f3472d_0
python_abi	conda-forge/linux-64::python_abi-3.11-2_cp311
scipy	conda-forge/linux-64::scipy-1.15.2-py311h8f841c2_0
suitesparse	conda-forge/linux-64::suitesparse-7.10.1-ha0f6916_7100102
sundials	conda-forge/linux-64::sundials-7.1.1-ha52427a_0

The following packages will be UPDATED:

conda	pkgs/main::conda-24.11.1-py311h06a430~ --> conda-forge::conda-25.1.1-py311h38be061_1
libgcc-ng	pkgs/main::libgcc-ng-11.2.0-h1234567_1 --> conda-forge::libgcc-ng-14.2.0-h69a702a_2

```
libgomp                pkgs/main::libgomp-11.2.0-h1234567_1 --> conda-forge::libgomp
-14.2.0-h767d61c_2
libstdcxx-ng           pkgs/main::libstdcxx-ng-11.2.0-h12345~ --> conda-forge::libstdc
xx-ng-14.2.0-h4852527_2
openssl                pkgs/main::openssl-3.0.16-h5eee18b_0 --> conda-forge::openssl
-3.4.1-h7b32b05_0
```

The following packages will be SUPERSEDED by a higher-priority channel:

```
certifi                pkgs/main/linux-64::certifi-2025.1.31~ --> conda-forge/noarch::
certifi-2025.1.31-pyhd8ed1ab_0
```

Downloading and Extracting Packages:

```
scipy-1.15.2           | 16.4 MB | : 0% 0/1 [00:00<?, ?it/s]
numpy-2.2.4            | 8.6 MB  | : 0% 0/1 [00:00<?, ?it/s]
```

```
libopenblas-0.3.29    | 5.6 MB  | : 0% 0/1 [00:00<?, ?it/s]
```

```
pyfmi-2.16.3          | 5.2 MB  | : 0% 0/1 [00:00<?, ?it/s]
```

```
metis-5.1.0           | 3.7 MB  | : 0% 0/1 [00:00<?, ?it/s]
```

```
libstdcxx-14.2.0      | 3.7 MB  | : 0% 0/1 [00:00<?, ?it/s]
```

```
openssl-3.4.1         | 2.8 MB  | : 0% 0/1 [00:00<?, ?it/s]
```

```
libgfortran5-14.2.0   | 1.4 MB  | : 0% 0/1 [00:00<?, ?it/s]
```

```
conda-25.1.1          | 1.1 MB  | : 0% 0/1 [00:00<?, ?it/s]
```

assimulo-3.6.0 | 1.1 MB | : 0% 0/1 [00:00<?, ?it/s]

libcholmod-5.3.1 | 1.1 MB | : 0% 0/1 [00:00<?, ?it/s]

sundials-7.1.1 | 907 KB | : 0% 0/1 [00:00<?, ?it/s]

libgcc-14.2.0 | 828 KB | : 0% 0/1 [00:00<?, ?it/s]

mpfr-4.2.1 | 620 KB | : 0% 0/1 [00:00<?, ?it/s]

gmp-6.3.0 | 449 KB | : 0% 0/1 [00:00<?, ?it/s]

libgomp-14.2.0 | 449 KB | : 0% 0/1 [00:00<?, ?it/s]

libumfpack-6.3.5 | 424 KB | : 0% 0/1 [00:00<?, ?it/s]

fmilib-2.4.1	383 KB	:	0% 0/1 [00:00<?, ?it/s]
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libspqr-4.3.4	213 KB	:	0% 0/1 [00:00<?, ?it/s]
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... (more hidden) ...			
scipy-1.15.2	16.4 MB	:	0% 0.0009529389827073913/1 [00:00<02:00, 120.14s/it]

pyfmi-2.16.3	5.2 MB	:	0% 0.002983953056648666/1 [00:00<00:36, 36.79s/it]
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metis-5.1.0	3.7 MB	:	0% 0.004175799528999174/1 [00:00<00:25, 25.76s/it]
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libopenblas-0.3.29	5.6 MB	:	0% 0.0027679004637044184/1 [00:00<00:42, 42.43s/it]
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scipy-1.15.2	16.4 MB	:	14% 0.1438937863888161/1 [00:00<00:01, 1.25s/it]
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pyfmi-2.16.3 t/s]	5.2 MB	: 42% 0.4207373809874619/1 [00:00<00:00, 2.37i
metis-5.1.0 t/s]	3.7 MB	: 57% 0.5720845354728868/1 [00:00<00:00, 3.24i
libopenblas-0.3.29 t/s]	5.6 MB	: 35% 0.35429125935416556/1 [00:00<00:00, 1.94i
scipy-1.15.2 t/s]	16.4 MB	: 40% 0.39928143375439695/1 [00:00<00:00, 1.57i
metis-5.1.0	3.7 MB	: 100% 1.0/1 [00:00<00:00, 3.25it/s]
metis-5.1.0	3.7 MB	: 100% 1.0/1 [00:00<00:00, 3.25it/s]
pyfmi-2.16.3	5.2 MB	: 100% 1.0/1 [00:00<00:00, 2.96it/s]
pyfmi-2.16.3	5.2 MB	: 100% 1.0/1 [00:00<00:00, 2.96it/s]
libstdcxx-14.2.0 5s/it]	3.7 MB	: 0% 0.0042177278432850495/1 [00:00<01:30, 90.5
libopenblas-0.3.29	5.6 MB	: 100% 1.0/1 [00:00<00:00, 2.84it/s]
scipy-1.15.2 t/s]	16.4 MB	: 68% 0.6823043116184921/1 [00:00<00:00, 2.06i
openssl-3.4.1 6s/it]	2.8 MB	: 1% 0.0055741049077571376/1 [00:00<01:15, 75.5
libgfortran5-14.2.0 s/it]	1.4 MB	: 1% 0.011206734985068174/1 [00:00<00:39, 39.66

scipy-1.15.2	16.4 MB	: 89% 0.8929038267968257/1 [00:00<00:00, 2.08it/s]
numpy-2.2.4	8.6 MB	: 100% 1.0/1 [00:00<00:00, 2.97it/s]

conda-25.1.1	1.1 MB	: 1% 0.013622478419712683/1 [00:00<00:39, 40.05s/it]
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libstdcxx-14.2.0	3.7 MB	: 100% 1.0/1 [00:00<00:00, 2.21it/s]
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libstdcxx-14.2.0	3.7 MB	: 100% 1.0/1 [00:00<00:00, 2.21it/s]
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openssl-3.4.1	2.8 MB	: 100% 1.0/1 [00:00<00:00, 2.19it/s]
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openssl-3.4.1	2.8 MB	: 100% 1.0/1 [00:00<00:00, 2.19it/s]
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conda-25.1.1	1.1 MB	: 100% 1.0/1 [00:00<00:00, 40.05s/it]
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assimulo-3.6.0	1.1 MB	: 1% 0.014703493605362324/1 [00:00<00:40, 40.68s/it]
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libcholmod-5.3.1 | 1.1 MB | : 1% 0.014870549794649543/1 [00:00<00:41, 42.12
s/it]

assimulo-3.6.0 | 1.1 MB | : 100% 1.0/1 [00:00<00:00, 40.68s/it]

sundials-7.1.1 | 907 KB | : 2% 0.01763373830085844/1 [00:00<00:35, 36.04
s/it]

libgcc-14.2.0 | 828 KB | : 2% 0.01932337522187561/1 [00:00<00:32, 32.97
s/it]

libgcc-14.2.0 | 828 KB | : 100% 1.0/1 [00:00<00:00, 32.97s/it]

mpfr-4.2.1 | 620 KB | : 3% 0.025811696239942908/1 [00:00<00:25, 26.26
s/it]

libcholmod-5.3.1 | 1.1 MB | : 100% 1.0/1 [00:00<00:00, 42.12s/it]

sundials-7.1.1 | 907 KB | : 100% 1.0/1 [00:00<00:00, 36.04s/it]

mpfr-4.2.1 | 620 KB | : 100% 1.0/1 [00:00<00:00, 26.26s/it]

gmp-6.3.0 | 449 KB | : 4% 0.03561313321233331/1 [00:00<00:19, 20.42
s/it]

gmp-6.3.0 | 449 KB | : 100% 1.0/1 [00:00<00:00, 20.42s/it]

fmilib-2.4.1 | 383 KB | : 4% 0.04180391656566945/1 [00:00<00:17, 17.85
s/it]

libgomp-14.2.0 | 449 KB | : 4% 0.03562807972826631/1 [00:00<00:20, 21.05
s/it]

libumfpack-6.3.5 | 424 KB | : 4% 0.037731330084655984/1 [00:00<00:19, 19.95
s/it]

metis-5.1.0 | 3.7 MB | : 100% 1.0/1 [00:00<00:00, 3.25it/s]

fmilib-2.4.1 | 383 KB | : 100% 1.0/1 [00:00<00:00, 17.85s/it]

libumfpack-6.3.5 | 424 KB | : 100% 1.0/1 [00:00<00:00, 19.95s/it]

libgomp-14.2.0 | 449 KB | : 100% 1.0/1 [00:00<00:00, 21.05s/it]

libspqr-4.3.4 | 213 KB | : 8% 0.07503068271326775/1 [00:00<00:09, 10.60s/it]

libspqr-4.3.4 | 213 KB | : 100% 1.0/1 [00:00<00:00, 10.60s/it]

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... (more hidden) ...

scipy-1.15.2	16.4 MB	: 100% 1.0/1 [00:00<00:00, 2.08it/s]
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libgfortran5-14.2.0	1.4 MB	: 100% 1.0/1 [00:01<00:00, 1.01it/s]
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libgfortran5-14.2.0	1.4 MB	: 100% 1.0/1 [00:01<00:00, 1.01it/s]
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libopenblas-0.3.29	5.6 MB	: 100% 1.0/1 [00:01<00:00, 2.84it/s]
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libstdcxx-14.2.0	3.7 MB	: 100% 1.0/1 [00:01<00:00, 2.21it/s]
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openssl-3.4.1 | 2.8 MB | : 100% 1.0/1 [00:01<00:00, 2.19it/s]

conda-25.1.1 | 1.1 MB | : 100% 1.0/1 [00:02<00:00, 1.95s/it]

conda-25.1.1 | 1.1 MB | : 100% 1.0/1 [00:02<00:00, 1.95s/it]

assimulo-3.6.0 | 1.1 MB | : 100% 1.0/1 [00:02<00:00, 2.12s/it]

assimulo-3.6.0 | 1.1 MB | : 100% 1.0/1 [00:02<00:00, 2.12s/it]

libgcc-14.2.0 | 828 KB | : 100% 1.0/1 [00:02<00:00, 2.20s/it]

libgcc-14.2.0	828 KB	: 100% 1.0/1 [00:02<00:00, 2.20s/it]
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libcholmod-5.3.1	1.1 MB	: 100% 1.0/1 [00:02<00:00, 2.25s/it]
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libcholmod-5.3.1	1.1 MB	: 100% 1.0/1 [00:02<00:00, 2.25s/it]
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sundials-7.1.1	907 KB	: 100% 1.0/1 [00:02<00:00, 2.41s/it]
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sundials-7.1.1	907 KB	: 100% 1.0/1 [00:02<00:00, 2.41s/it]
numpy-2.2.4	8.6 MB	: 100% 1.0/1 [00:02<00:00, 2.97it/s]

gmp-6.3.0 | 449 KB | : 100% 1.0/1 [00:02<00:00, 2.45s/it]

gmp-6.3.0 | 449 KB | : 100% 1.0/1 [00:02<00:00, 2.45s/it]

mpfr-4.2.1 | 620 KB | : 100% 1.0/1 [00:02<00:00, 2.48s/it]

mpfr-4.2.1 | 620 KB | : 100% 1.0/1 [00:02<00:00, 2.48s/it]

libumfpack-6.3.5 | 424 KB | : 100% 1.0/1 [00:02<00:00, 2.49s/it]

libumfpack-6.3.5 | 424 KB | : 100% 1.0/1 [00:02<00:00, 2.49s/it]

fmilib-2.4.1 | 383 KB | : 100% 1.0/1 [00:02<00:00, 2.53s/it]

fmilib-2.4.1 | 383 KB | : 100% 1.0/1 [00:02<00:00, 2.53s/it]

libspqr-4.3.4 | 213 KB | : 100% 1.0/1 [00:02<00:00, 2.57s/it]

libspqr-4.3.4 | 213 KB | : 100% 1.0/1 [00:02<00:00, 2.57s/it]

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libgomp-14.2.0 | 449 KB | : 100% 1.0/1 [00:02<00:00, 2.57s/it]

scipy-1.15.2 | 16.4 MB | : 100% 1.0/1 [00:03<00:00, 2.08it/s]


```
Preparing transaction: - 00\ 00done
Verifying transaction: / 00- 00\ 00| 00/ 00done
Executing transaction: \ 00| 00/ 00- 00\ 00| 00/ 00- 00\ 00| 00/ 00- 00\ 00| 00/ 00-
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```

BPL_TEST2_Batch setup

Now specific installation and the run simulations. Start with connecting to Github. Then upload the two files:

- FMU - BPL_TEST2_Batch_linux_om_me.fmu
- Setup-file - BPL_TEST2_Batch_explore.me.py

```
In [9]: %%bash
git clone https://github.com/janpeter19/BPL_TEST2_Batch
```

Cloning into 'BPL_TEST2_Batch'...

```
In [10]: %cd BPL_TEST2_Batch
/content/BPL_TEST2_Batch
```

```
In [11]: run -i BPL_TEST2_Batch_explore.py
```

Linux - run FMU pre-compiled OpenModelica

Model for the process has been setup. Key commands:

- par() - change of parameters and initial values
- init() - change initial values only
- simu() - simulate and plot
- newplot() - make a new plot
- show() - show plot from previous simulation
- disp() - display parameters and initial values from the last simulation
- describe() - describe culture, broth, parameters, variables with values/units

Note that both disp() and describe() takes values from the last simulation and the command process_diagram() brings up the main configuration

Brief information about a command by help(), eg help(simu)

Key system information is listed with the command system_info()

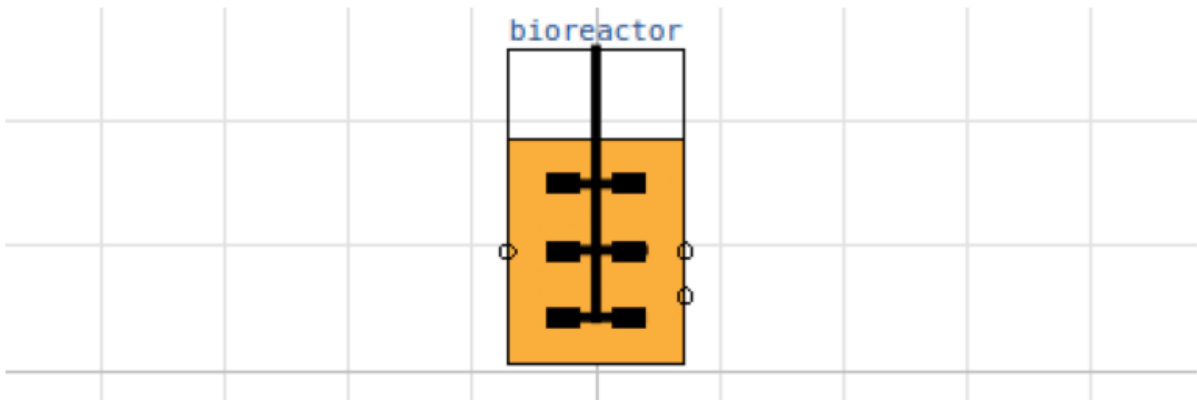
```
In [12]: %matplotlib inline
plt.rcParams['figure.figsize'] = [25/2.54, 20/2.54]
```

```
In [13]: import warnings
warnings.filterwarnings("ignore")
```

BPL_TEST2_Batch - demo

```
In [14]: process_diagram()
```

No processDiagram.png file in the FMU, but try the file on disk.

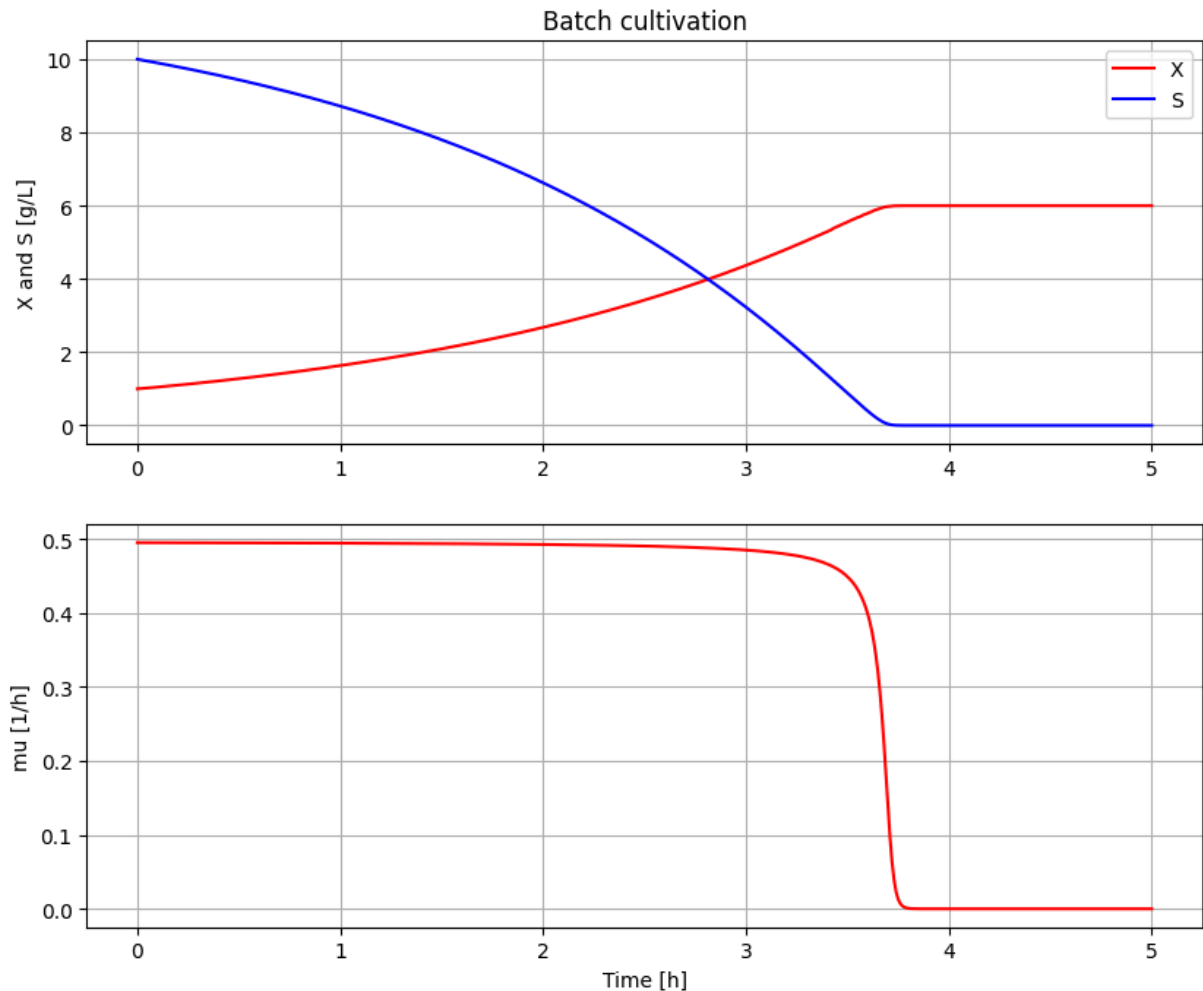


```
In [15]: describe('culture'); print(); #describe('Liquidphase')
```

Simplified text book model - only substrate S and cell concentration X

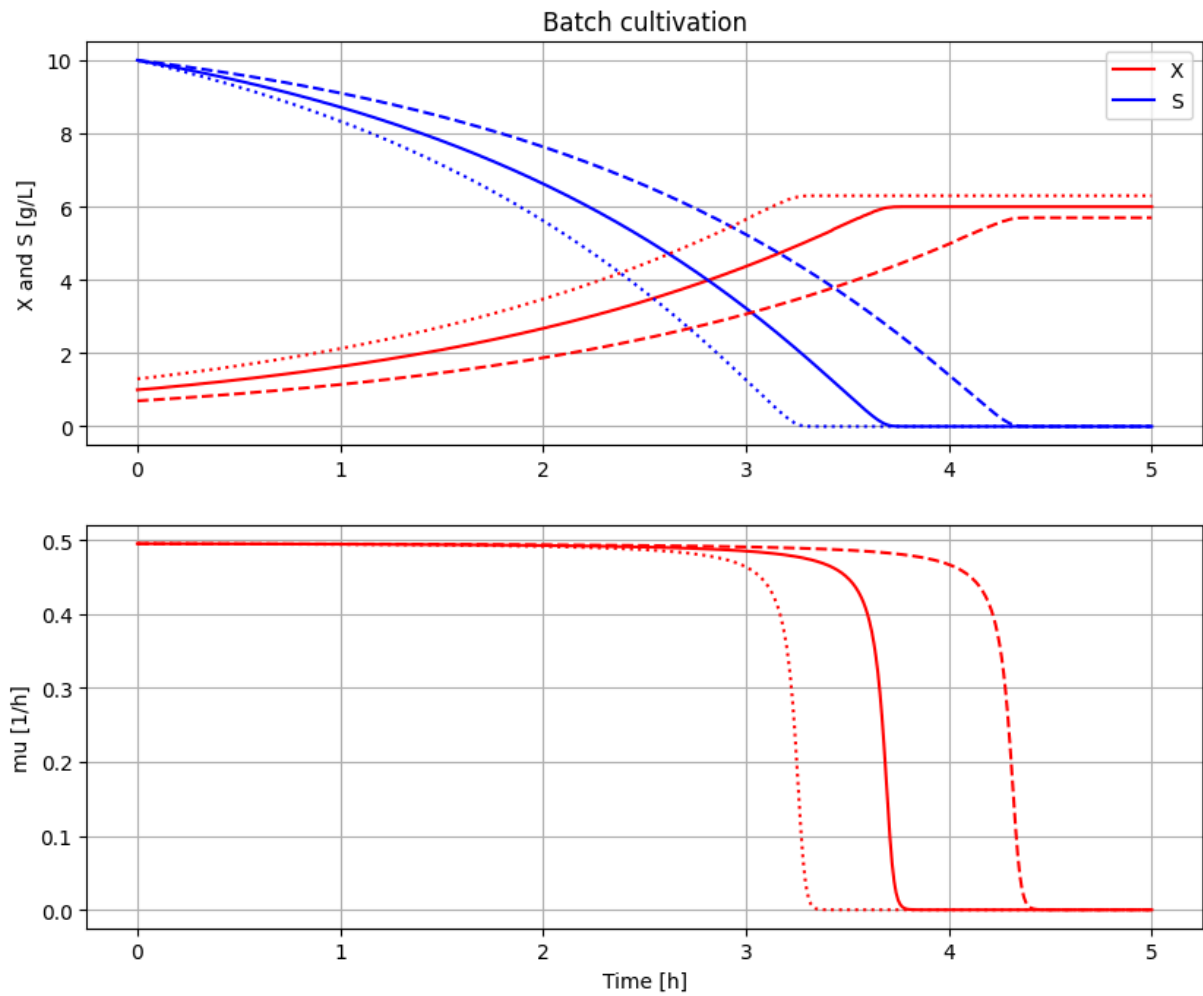
```
In [16]: # Simulation with default values of the process
newplot(plotType='TimeSeries')
simu()
```


Could not find cannot import name 'dopri5' from 'assimulo.lib' (/usr/local/lib/python3.11/site-packages/assimulo/lib/__init__.py)
 Could not find cannot import name 'rodas' from 'assimulo.lib' (/usr/local/lib/python3.11/site-packages/assimulo/lib/__init__.py)
 Could not find cannot import name 'odassl' from 'assimulo.lib' (/usr/local/lib/python3.11/site-packages/assimulo/lib/__init__.py)
 Could not find ODEPACK functions.
 Could not find RADAR5
 Could not find GLIMDA.



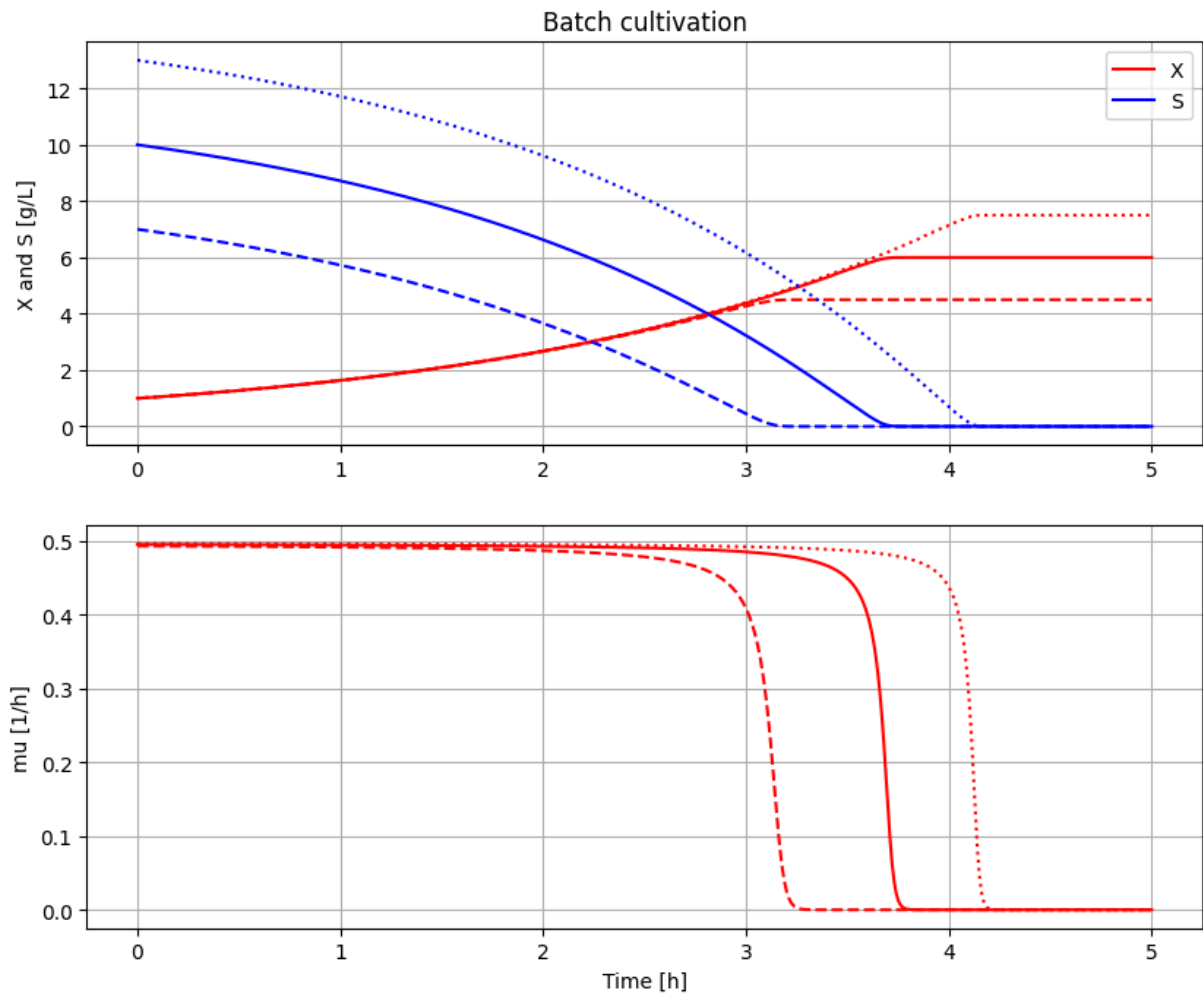
```
In [17]: # Simulation were initial value of biomass VX_0 is varied
newplot(plotType='TimeSeries')
for value in [1.0, 0.7, 1.3]: init(VX_start=value); simu(5)

# Restore default value of VX_start
init(VX_start=1.0)
```



```
In [18]: # Simulation were initial value of substrate  $VS_0$  is varied
newplot(plotType='TimeSeries')
for value in [10, 7, 13]: init(VS_start=value); simu(5)

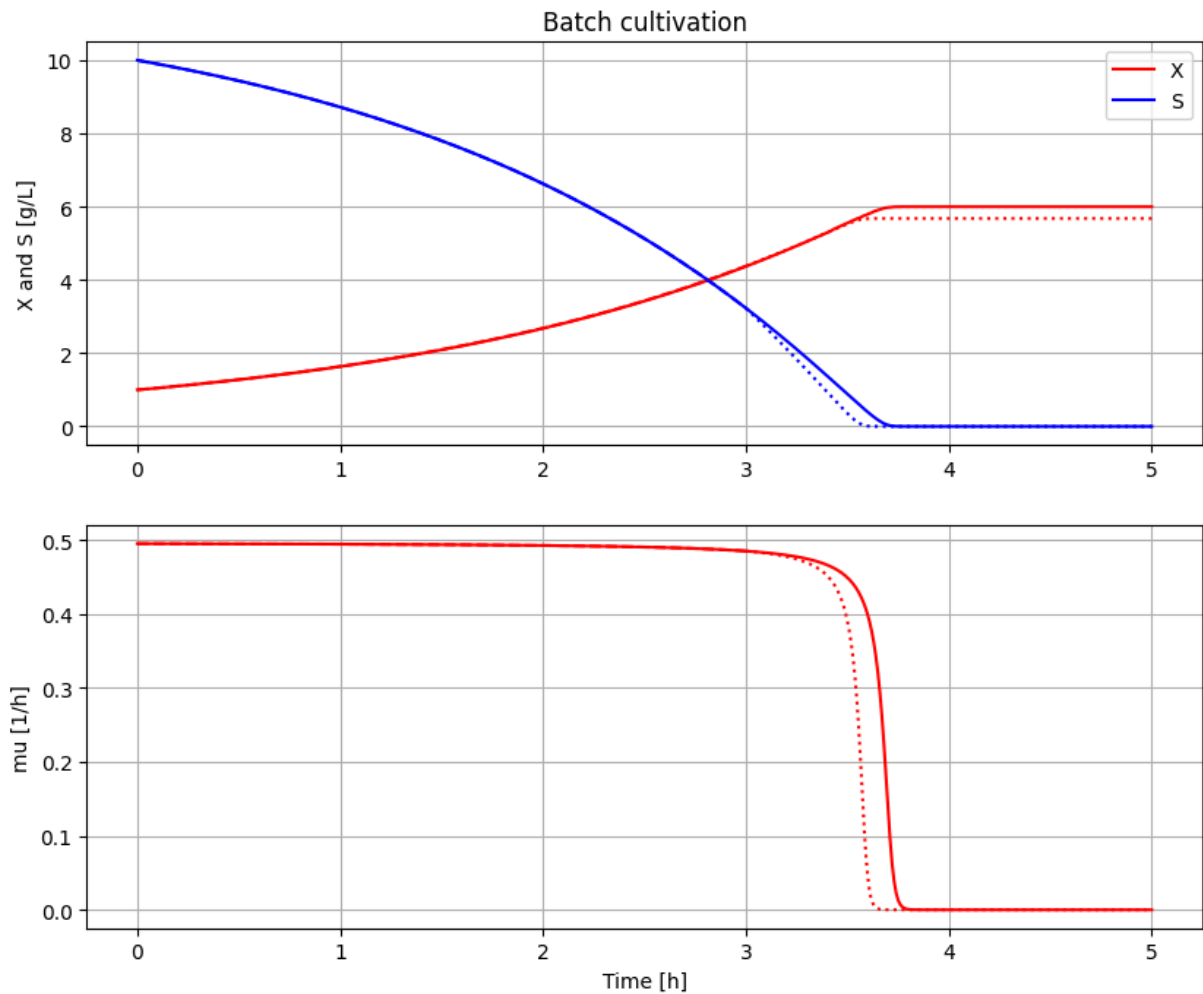
# Restore default value of  $VS_{start}$ 
init(VS_start=10)
```



```
In [19]: # Simulation where metabolism is changed after 3 hours
newplot(plotType='TimeSeries')
simu(5)

simu(3)
par(Y=0.4, qSmax=1.0/(0.4/0.5)); simu(2, 'cont')

# Restore default value of Y and qSmax
par(Y=0.5, qSmax=1.0)
```



```
In [20]: disp('culture')
```

```
Y : 0.4
qSmax : 1.25
Ks : 0.1
```

```
In [21]: describe('mu')
```

```
Cell specific growth rate variable : 0.0 [ 1/h ]
```

```
In [22]: describe('parts')
```

```
['bioreactor', 'bioreactor.culture']
```

```
In [23]: describe('MSL')
```

```
MSL: 3.2.3 - used components: none
```

```
In [24]: system_info()
```

System information

- OS: Linux
- Python: 3.11.11
- Scipy: not installed in the notebook
- PyFMI: 2.16.3
- FMU by: OpenModelica Compiler OpenModelica 1.25.0~dev-133-ga5470be
- FMI: 2.0
- Type: FMUModelME2
- Name: BPL.Examples_TEST2.Batch
- Generated: 2024-11-06T21:35:34Z
- MSL: 3.2.3
- Description: Bioprocess Library version 2.3.0
- Interaction: FMU-explore version 1.0.0

In [24]:

