



BPL_TEST2_Batch script with PyFMI ver 2.9.8

The key library PyFMI ver 2.9.8 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 [ ]: !lsb_release -a # Actual VM Ubuntu version used by Google
```

```
No LSB modules are available.  
Distributor ID: Ubuntu  
Description:    Ubuntu 20.04.5 LTS  
Release:        20.04  
Codename:       focal
```

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

```
env: PYTHONPATH=
```

```
In [ ]: !wget https://repo.anaconda.com/miniconda/Miniconda3-py38_22.11.1-1-Linux  
!chmod +x Miniconda3-py38_22.11.1-1-Linux-x86_64.sh  
!bash ./Miniconda3-py38_22.11.1-1-Linux-x86_64.sh -b -f -p /usr/local  
import sys  
sys.path.append('/usr/local/lib/python3.8/site-packages/')
```

```
--2023-01-20 12:38:18-- https://repo.anaconda.com/miniconda/Miniconda3-
py38_22.11.1-1-Linux-x86_64.sh
Resolving repo.anaconda.com (repo.anaconda.com)... 104.16.130.3, 104.16.
131.3, 2606:4700::6810:8303, ...
Connecting to repo.anaconda.com (repo.anaconda.com)|104.16.130.3|:443...
connected.
HTTP request sent, awaiting response... 200 OK
Length: 64630241 (62M) [application/x-sh]
Saving to: 'Miniconda3-py38_22.11.1-1-Linux-x86_64.sh'
```

```
Miniconda3-py38_22. 100%[=====>] 61.64M 207MB/s in
0.3s
```

```
2023-01-20 12:38:19 (207 MB/s) - 'Miniconda3-py38_22.11.1-1-Linux-x86_6
4.sh' saved [64630241/64630241]
```

```
PREFIX=/usr/local
Unpacking payload ...
```

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

```
Downloading and Extracting Packages
```

```
Downloading and Extracting Packages
```

```
Preparing transaction: - \ | / - \ done
Executing transaction: / - \ | / - \ | / - \ | / - \ | /
- \ | / - \ | / - \ | / - \ | / - \
| / - \ done
installation finished.
```

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

```
Collecting package metadata (current_repodata.json): - \ | / -
\ | / - \ | / - \ | / - \ |
/ - \ | done
Solving environment: - \ | / - \ | / - \ | / don
e
```

Package Plan

```
environment location: /usr/local

added / updated specs:
- conda
```

The following packages will be downloaded:

package	build	
conda-package-handling-2.0.2	py38h06a4308_0	267 KB
conda-package-streaming-0.7.0	py38h06a4308_0	26 KB
cryptography-38.0.4	py38h9ce1e76_0	1.4 MB
sqlite-3.40.1	h5082296_0	1.2 MB
urllib3-1.26.14	py38h06a4308_0	196 KB
xz-5.2.10	h5eee18b_1	429 KB
zstandard-0.18.0	py38h5eee18b_0	434 KB
Total:		3.9 MB

The following NEW packages will be INSTALLED:

```
conda-package-str~ pkgs/main/linux-64::conda-package-streaming-0.7.0-p
y38h06a4308_0
zstandard          pkgs/main/linux-64::zstandard-0.18.0-py38h5eee18b_0
```

The following packages will be UPDATED:

```
conda-package-han~          1.9.0-py38h5eee18b_1 --> 2.0.2-py
38h06a4308_0
cryptography                38.0.1-py38h9ce1e76_0 --> 38.0.4-p
y38h9ce1e76_0
sqlite                      3.40.0-h5082296_0 --> 3.40.1-h
5082296_0
urllib3                     1.26.13-py38h06a4308_0 --> 1.26.14-
py38h06a4308_0
xz                          5.2.8-h5eee18b_0 --> 5.2.10-h
5eee18b_1
```

Downloading and Extracting Packages

```
sqlite-3.40.1      | 1.2 MB | : 0% 0/1 [00:00<?, ?it/s]
zstandard-0.18.0   | 434 KB | : 0% 0/1 [00:00<?, ?it/s]

urllib3-1.26.14    | 196 KB | : 0% 0/1 [00:00<?, ?it/s]

conda-package-stream | 26 KB | : 0% 0/1 [00:00<?, ?it/s]
```

conda-package-handli | 267 KB | : 0% 0/1 [00:00<?, ?it/s]

cryptography-38.0.4 | 1.4 MB | : 0% 0/1 [00:00<?, ?it/s]

sqlite-3.40.1 | 1.2 MB | : 64% 0.6436035092313735/1 [00:00<00:00, 6.43it/s]

cryptography-38.0.4 | 1.4 MB | : 1% 0.011144350078426731/1 [00:00<00:09, 9.38s/it]

conda-package-stream | 26 KB | : 100% 1.0/1 [00:00<00:00, 6.33it/s]

conda-package-stream | 26 KB | : 100% 1.0/1 [00:00<00:00, 6.33it/s]

urllib3-1.26.14 | 196 KB | : 100% 1.0/1 [00:00<00:00, 4.89it/s]

urllib3-1.26.14 | 196 KB | : 100% 1.0/1 [00:00<00:00, 4.89it/s]

conda-package-handli | 267 KB | : 100% 1.0/1 [00:00<00:00, 4.22it/s]

conda-package-handli | 267 KB | : 100% 1.0/1 [00:00<00:00, 4.22it/s]

zstandard-0.18.0 | 434 KB | : 100% 1.0/1 [00:00<00:00, 3.52it/s]

zstandard-0.18.0 | 434 KB | : 100% 1.0/1 [00:00<00:00, 3.52it/s]

xz-5.2.10 | 429 KB | : 100% 1.0/1 [00:00<00:00, 3.12it/s]

sqlite-3.40.1 | 1.2 MB | : 100% 1.0/1 [00:00<00:00, 6.43it/s]

cryptography-38.0.4 | 1.4 MB | : 100% 1.0/1 [00:00<00:00, 2.35it/s]

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

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

```
conda 22.11.1
Python 3.8.15
```

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

```
Collecting package metadata (current_repodata.json): - \ | / -
\ | / - \ | / - \ | / - \ | / - \ | / - \ | / - \ | / -
/ - \ | / - \ | / - \ | / - \ | / - \ | / - \ | / - \ | / -
\ | / - \ | / - \ | / - \ | / - \ | / - \ | / - \ | / - \ | / -
/ - \ | / - \ | / - \ | / - \ | / - \ | / - \ | / - \ | / -
\ | / - \ | / - \ | / - \ | / - \ | / - \ | / - \ | / - \ | / -
/ - \ | / - \ | / - \ | / - \ | / - \ | / - \ | / - \ | / -
done
Solving environment: / - \ | / - \ | / - \ | / - \ | / - \ | / -
- \ | / - \ | / - \ | / - \ | / - \ | / - \ | / - \ | / -
| / - \ | / - \ | / - \ | / - \ | / - \ | / - \ | / - \ | / -
- \ | / - \ | / - \ | / - \ | / - \ | / - \ | / - \ | / -
| / - \ | / - \ | / - \ | / - \ | / - \ | / - \ | / - \ | / -
done
```

Package Plan

environment location: /usr/local

added / updated specs:

- pyfmi

The following packages will be downloaded:

package	build		
-----	-----		
_libgcc_mutex-0.1	conda_forge	3 KB	conda-
forge			
_openmp_mutex-4.5	2_kmp_llvm	6 KB	conda-
forge			
appdirs-1.4.4	pyh9f0ad1d_0	13 KB	conda-
forge			
assimulo-3.3	py38h71f17ff_1	2.4 MB	conda-
forge			
ca-certificates-2022.12.7	ha878542_0	143 KB	conda-
forge			
certifi-2022.12.7	pyhd8ed1ab_0	147 KB	conda-
forge			
conda-22.11.1	py38h578d9bd_1	905 KB	conda-
forge			
fmilib-2.4.1	h27087fc_0	545 KB	conda-
forge			
gmp-6.2.1	h58526e2_0	806 KB	conda-
forge			
icu-58.2	hf484d3e_1000	22.6 MB	conda-
forge			
libblas-3.9.0	16_linux64_openblas	13 KB	cond
a-forge			
libcbblas-3.9.0	16_linux64_openblas	13 KB	cond
a-forge			
libgcc-ng-12.2.0	h65d4601_19	931 KB	conda-
forge			
libgfortran-ng-12.2.0	h69a702a_19	22 KB	conda-
forge			
libgfortran5-12.2.0	h337968e_19	1.8 MB	conda-
forge			
libhwloc-2.8.0	h32351e8_1	3.0 MB	conda-
forge			
liblapack-3.9.0	16_linux64_openblas	13 KB	cond

a-forge			
libopenblas-0.3.21		pthread_h78a6416_3	10.1 MB conda-
a-forge			
libstdcxx-ng-12.2.0		h46fd767_19	4.3 MB conda-
forge			
libxml2-2.9.14		h74e7548_0	718 KB
libxslt-1.1.35		h4e12654_0	453 KB
llvm-openmp-14.0.6		h9e868ea_0	4.4 MB
lxml-4.9.1		py38h1edc446_0	1.3 MB
metis-5.1.0		h58526e2_1006	4.1 MB conda-
forge			
mpfr-4.1.0		h9202a9a_1	2.6 MB conda-
forge			
numpy-1.24.1		py38hab0fcb9_0	6.3 MB conda-
forge			
openssl-1.1.1s		h0b41bf4_1	1.9 MB conda-
forge			
packaging-23.0		pyhd8ed1ab_0	40 KB conda-
forge			
pooch-1.6.0		pyhd8ed1ab_0	44 KB conda-
forge			
pyfmi-2.9.8		py38h26c90d9_1	12.7 MB conda-
forge			
python_abi-3.8		2_cp38	4 KB conda-
forge			
scipy-1.10.0		py38h10c12cc_0	23.5 MB conda-
forge			
suitesparse-5.10.1		h9e50725_1	2.4 MB conda-
forge			
sundials-6.4.1		h89a52a3_0	1.2 MB conda-
forge			
tbb-2021.7.0		h924138e_1	1.5 MB conda-
forge			

Total:			110.5 MB

The following NEW packages will be INSTALLED:

appdirs	conda-forge/noarch::appdirs-1.4.4-pyh9f0ad1d_0
assimulo	conda-forge/linux-64::assimulo-3.3-py38h71f17ff_1
fmilib	conda-forge/linux-64::fmilib-2.4.1-h27087fc_0
gmp	conda-forge/linux-64::gmp-6.2.1-h58526e2_0
icu	conda-forge/linux-64::icu-58.2-hf484d3e_1000
libblas	conda-forge/linux-64::libblas-3.9.0-16_linux64_open
blas	
libcbblas	conda-forge/linux-64::libcbblas-3.9.0-16_linux64_ope
nblas	
libgfortran-ng	conda-forge/linux-64::libgfortran-ng-12.2.0-h69a702
a_19	
libgfortran5	conda-forge/linux-64::libgfortran5-12.2.0-h337968e_
19	
libhwloc	conda-forge/linux-64::libhwloc-2.8.0-h32351e8_1
liblapack	conda-forge/linux-64::liblapack-3.9.0-16_linux64_op
enblas	
libopenblas	conda-forge/linux-64::libopenblas-0.3.21-pthreads_h
78a6416_3	
libxml2	pkgs/main/linux-64::libxml2-2.9.14-h74e7548_0
libxslt	pkgs/main/linux-64::libxslt-1.1.35-h4e12654_0
llvm-openmp	pkgs/main/linux-64::llvm-openmp-14.0.6-h9e868ea_0
lxml	pkgs/main/linux-64::lxml-4.9.1-py38h1edc446_0

```
metis          conda-forge/linux-64::metis-5.1.0-h58526e2_1006
mpfr           conda-forge/linux-64::mpfr-4.1.0-h9202a9a_1
numpy          conda-forge/linux-64::numpy-1.24.1-py38hab0fcb9_0
packaging      conda-forge/noarch::packaging-23.0-pyhd8ed1ab_0
pooch          conda-forge/noarch::pooch-1.6.0-pyhd8ed1ab_0
pyfmi          conda-forge/linux-64::pyfmi-2.9.8-py38h26c90d9_1
python_abi     conda-forge/linux-64::python_abi-3.8-2_cp38
scipy          conda-forge/linux-64::scipy-1.10.0-py38h10c12cc_0
suitesparse    conda-forge/linux-64::suitesparse-5.10.1-h9e50725_1
sundials       conda-forge/linux-64::sundials-6.4.1-h89a52a3_0
tbb            conda-forge/linux-64::tbb-2021.7.0-h924138e_1
```

The following packages will be REMOVED:

```
libgomp-11.2.0-h1234567_1
```

The following packages will be UPDATED:

```
ca-certificates pkgs/main::ca-certificates-2022.10.11~ --> conda-fo
rge::ca-certificates-2022.12.7-ha878542_0
libgcc-ng        pkgs/main::libgcc-ng-11.2.0-h1234567_1 --> conda-fo
rge::libgcc-ng-12.2.0-h65d4601_19
libstdcxx-ng     pkgs/main::libstdcxx-ng-11.2.0-h12345~ --> conda-fo
rge::libstdcxx-ng-12.2.0-h46fd767_19
openssl          pkgs/main::openssl-1.1.1s-h7f8727e_0 --> conda-fo
rge::openssl-1.1.1s-h0b41bf4_1
```

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

```
_libgcc_mutex    pkgs/main::_libgcc_mutex-0.1-main --> conda-fo
rge::_libgcc_mutex-0.1-conda_forge
_openmp_mutex     pkgs/main::_openmp_mutex-5.1-1_gnu --> conda-fo
rge::_openmp_mutex-4.5-2_kmp_llvm
certifi           pkgs/main/linux-64::certifi-2022.12.7~ --> conda-fo
rge/noarch::certifi-2022.12.7-pyhd8ed1ab_0
conda             pkgs/main::conda-22.11.1-py38h06a4308~ --> conda-fo
rge::conda-22.11.1-py38h578d9bd_1
```

Downloading and Extracting Packages

```
libxml2-2.9.14      | 718 KB      | :    0% 0/1 [00:00<?, ?it/s]
icu-58.2            | 22.6 MB     | :    0% 0/1 [00:00<?, ?it/s]
```

```
libgfortran-ng-12.2. | 22 KB       | :    0% 0/1 [00:00<?, ?it/s]
```

```
assimulo-3.3        | 2.4 MB      | :    0% 0/1 [00:00<?, ?it/s]
```

```
pyfmi-2.9.8         | 12.7 MB     | :    0% 0/1 [00:00<?, ?it/s]
```

```
llvm-openmp-14.0.6  | 4.4 MB      | :    0% 0/1 [00:00<?, ?it/s]
```


scipy-1.10.0	23.5 MB	:	0% 0/1 [00:00<?, ?it/s]
libhwloc-2.8.0	3.0 MB	:	0% 0/1 [00:00<?, ?it/s]
libxslt-1.1.35	453 KB	:	0% 0/1 [00:00<?, ?it/s]
sundials-6.4.1	1.2 MB	:	0% 0/1 [00:00<?, ?it/s]
libcbblas-3.9.0	13 KB	:	0% 0/1 [00:00<?, ?it/s]
python_abi-3.8	4 KB	:	0% 0/1 [00:00<?, ?it/s]
certifi-2022.12.7	147 KB	:	0% 0/1 [00:00<?, ?it/s]

mpfr-4.1.0 | 2.6 MB | : 0% 0/1 [00:00<?, ?it/s]

_libgcc_mutex-0.1 | 3 KB | : 0% 0/1 [00:00<?, ?it/s]

appdirs-1.4.4 | 13 KB | : 0% 0/1 [00:00<?, ?it/s]

metis-5.1.0 | 4.1 MB | : 0% 0/1 [00:00<?, ?it/s]

gmp-6.2.1 | 806 KB | : 0% 0/1 [00:00<?, ?it/s]

libopenblas-0.3.21 | 10.1 MB | : 0% 0/1 [00:00<?, ?it/s]

... (more hidden) ...
icu-58.2 | 22.6 MB | : 1% 0.008308815717374497/1 [00:00<00:11, 12.06s/it]

assimulo-3.3 | 2.4 MB | : 14% 0.13765362627831026/1 [00:00<00:00, 1.37it/s]

```
llvm-openmp-14.0.6 | 4.4 MB | : 9% 0.092869167717116/1 [00:00<00:00, 1.08s/it]
```

```
pyfmi-2.9.8 | 12.7 MB | : 1% 0.008609922566400747/1 [00:00<00:12, 12.76s/it]
```

```
scipy-1.10.0 | 23.5 MB | : 0% 0.0006660983852196085/1 [00:00<02:38, 158.12s/it]
icu-58.2 | 22.6 MB | : 7% 0.07270213752702685/1 [00:00<00:02, 2.45s/it]
```

```
assimulo-3.3 | 2.4 MB | : 81% 0.8128118885004987/1 [00:00<00:00, 4.51it/s]
```

```
llvm-openmp-14.0.6 | 4.4 MB | : 38% 0.38219234406659275/1 [00:00<00:00, 2.08it/s]
```

```
pyfmi-2.9.8 | 12.7 MB | : 15% 0.14513869469075544/1 [00:00<00:01, 1.24s/it]
```

```
scipy-1.10.0 | 23.5 MB | : 6% 0.06394544498108243/1 [00:00<00:02, 2.74s/it]
```

```
libgfortran-ng-12.2. | 22 KB | : 100% 1.0/1 [00:00<00:00, 3.75it/s]
```

```
libhwloc-2.8.0 | 3.0 MB | : 1% 0.005266267282350226/1 [00:00<00:48, 48.62s/it]
```

```
libgfortran-ng-12.2. | 22 KB | : 100% 1.0/1 [00:00<00:00, 3.75it/s]
icu-58.2 | 22.6 MB | : 14% 0.13709545933667922/1 [00:00<00:01, 1.95s/it]
```

```
llvm-openmp-14.0.6 | 4.4 MB | : 74% 0.739381450670885/1 [00:00<00:00, 2.69it/s]
```

pyfmi-2.9.8 | 12.7 MB | : 29% 0.2878174115053964/1 [00:00<0
0:00, 1.02it/s]

scipy-1.10.0 | 23.5 MB | : 12% 0.1165672174134315/1 [00:00<0
0:02, 2.39s/it]

libxml2-2.9.14 | 718 KB | : 100% 1.0/1 [00:00<00:00, 2.47it/s]
libxml2-2.9.14 | 718 KB | : 100% 1.0/1 [00:00<00:00, 2.47it/s]

libxslt-1.1.35 | 453 KB | : 4% 0.03535018997706466/1 [00:00<0
0:10, 11.26s/it]

pyfmi-2.9.8 | 12.7 MB | : 39% 0.39236647124026264/1 [00:00<0
0:00, 1.03it/s]

scipy-1.10.0 | 23.5 MB | : 19% 0.1865075478614904/1 [00:00<0
0:01, 1.91s/it]

libhwloc-2.8.0 | 3.0 MB | : 97% 0.9689931799524416/1 [00:00<0
0:00, 2.72it/s]
icu-58.2 | 22.6 MB | : 28% 0.2783453265320457/1 [00:00<0
0:01, 1.59s/it]

libcbblas-3.9.0 | 13 KB | : 100% 1.0/1 [00:00<00:00, 2.00it/s]

sundials-6.4.1 | 1.2 MB | : 1% 0.013387928801451884/1 [00:00<00:37, 37.81s/it]

pyfmi-2.9.8 | 12.7 MB | : 53% 0.5301252323026746/1 [00:00<00:00, 1.15it/s]

scipy-1.10.0 | 23.5 MB | : 25% 0.24978689445735322/1 [00:00<00:01, 1.81s/it]

python_abi-3.8 | 4 KB | : 100% 1.0/1 [00:00<00:00, 1.89it/s]

certifi-2022.12.7 | 147 KB | : 11% 0.10862920603348251/1 [00:00<00:04, 5.18s/it]

mpfr-4.1.0 | 2.6 MB | : 1% 0.0060485553093571716/1 [00:00<00:00, 0.00s/it]

<01:36, 96.73s/it]

_libgcc_mutex-0.1 | 3 KB | : 100% 1.0/1 [00:00<00:00, 1.69it/s]
icu-58.2 | 22.6 MB | : 34% 0.3413538457221356/1 [00:00<0
0:01, 1.70s/it]

pyfmi-2.9.8 | 12.7 MB | : 65% 0.645744192480056/1 [00:00<00:
00, 1.13it/s]

scipy-1.10.0 | 23.5 MB | : 31% 0.31439843782365523/1 [00:00<0
0:01, 1.72s/it]

appdirs-1.4.4 | 13 KB | : 100% 1.0/1 [00:00<00:00, 1.60it/s]

metis-5.1.0 | 4.1 MB | : 0% 0.003823948974180876/1 [00:00<

02:51, 172.46s/it]

mpfr-4.1.0 | 2.6 MB | : 84% 0.8407491880006468/1 [00:00<0
0:00, 1.65it/s]
icu-58.2 | 22.6 MB | : 41% 0.41267118062960007/1 [00:00<0
0:00, 1.59s/it]

scipy-1.10.0 | 23.5 MB | : 39% 0.39299804727956905/1 [00:00<0
0:00, 1.55s/it]

gmp-6.2.1 | 806 KB | : 2% 0.019840539414665338/1 [00:00<
00:36, 37.71s/it]

pyfmi-2.9.8 | 12.7 MB | : 76% 0.7601331637193802/1 [00:00<0
0:00, 1.00s/it]

metis-5.1.0	4.1 MB	: 49% 0.493289417669333/1 [00:00<00:
00, 1.14s/it]		
icu-58.2	22.6 MB	: 49% 0.4888353247055329/1 [00:00<0
0:00, 1.50s/it]		

libopenblas-0.3.21	10.1 MB	: 0% 0.0015489208557598652/1 [00:00
<08:44, 525.17s/it]		

scipy-1.10.0	23.5 MB	: 46% 0.46293837772762797/1 [00:00<0
0:00, 1.53s/it]		

pyfmi-2.9.8	12.7 MB	: 91% 0.911421803100422/1 [00:00<00:
00, 1.14it/s]		

metis-5.1.0	4.1 MB	: 92% 0.921571702777591/1 [00:00<00:
00, 1.55it/s]		
icu-58.2	22.6 MB	: 56% 0.5587678569934349/1 [00:00<0
0:00, 1.49s/it]		

... (more hidden) ...

libopenblas-0.3.21 | 10.1 MB | : 7% 0.07279928022071366/1 [00:00<0
0:08, 9.53s/it]

scipy-1.10.0 | 23.5 MB | : 53% 0.5288821178643692/1 [00:00<0
0:00, 1.62s/it]

libopenblas-0.3.21 | 10.1 MB | : 21% 0.21065323638334166/1 [00:01<0
0:02, 3.09s/it]

icu-58.2 | 22.6 MB | : 63% 0.6266231853519934/1 [00:01<0
0:00, 1.71s/it]

scipy-1.10.0 | 23.5 MB | : 59% 0.5941597596158908/1 [00:01<0
0:00, 1.68s/it]

libopenblas-0.3.21 | 10.1 MB | : 31% 0.3113330920077329/1 [00:01<0
0:01, 2.19s/it]

scipy-1.10.0 | 23.5 MB | : 66% 0.6561069094413144/1 [00:01<0
0:00, 1.67s/it]
icu-58.2 | 22.6 MB | : 73% 0.7256365726507061/1 [00:01<0
0:00, 1.46s/it]

libopenblas-0.3.21 | 10.1 MB | : 47% 0.4739697818625187/1 [00:01<0
0:00, 1.41s/it]

llvm-openmp-14.0.6 | 4.4 MB | : 100% 1.0/1 [00:01<00:00, 2.69it/s]

scipy-1.10.0 | 23.5 MB | : 74% 0.742033601134644/1 [00:01<00:00, 1.49s/it]
icu-58.2 | 22.6 MB | : 82% 0.8198031507809505/1 [00:01<00:00, 1.33s/it]

libopenblas-0.3.21 | 10.1 MB | : 59% 0.5885899251887488/1 [00:01<00:00, 1.27s/it]
icu-58.2 | 22.6 MB | : 90% 0.8980444987862269/1 [00:01<00:00, 1.32s/it]

scipy-1.10.0 | 23.5 MB | : 81% 0.8106417348122636/1 [00:01<00:00, 1.51s/it]

libopenblas-0.3.21 | 10.1 MB | : 72% 0.7186992770725774/1 [00:01<00:00, 1.10s/it]
icu-58.2 | 22.6 MB | : 98% 0.9790554520306283/1 [00:01<00:00, 1.29s/it]

scipy-1.10.0 | 23.5 MB | : 90% 0.8992328200464715/1 [00:01<00:00, 1.38s/it]

libopenblas-0.3.21 | 10.1 MB | : 87% 0.8704935209370441/1 [00:01<00:00, 1.06it/s]

scipy-1.10.0 | 23.5 MB | : 97% 0.9725036424206285/1 [00:01<00:00, 1.42s/it]

libxslt-1.1.35 | 453 KB | : 100% 1.0/1 [00:01<00:00, 1.63s/it]

libxslt-1.1.35 | 453 KB | : 100% 1.0/1 [00:01<00:00, 1.63s/it]

assimulo-3.3 | 2.4 MB | : 100% 1.0/1 [00:02<00:00, 4.51it/s]

libcbblas-3.9.0	13 KB	: 100% 1.0/1 [00:02<00:00, 2.00it/s]
python_abi-3.8	4 KB	: 100% 1.0/1 [00:02<00:00, 1.89it/s]
libhwloc-2.8.0	3.0 MB	: 100% 1.0/1 [00:02<00:00, 2.72it/s]
sundials-6.4.1	1.2 MB	: 100% 1.0/1 [00:02<00:00, 2.47s/it]
sundials-6.4.1	1.2 MB	: 100% 1.0/1 [00:02<00:00, 2.47s/it]
certifi-2022.12.7	147 KB	: 100% 1.0/1 [00:02<00:00, 2.54s/it]

certifi-2022.12.7 | 147 KB | : 100% 1.0/1 [00:02<00:00, 2.54s/it]

_libgcc_mutex-0.1 | 3 KB | : 100% 1.0/1 [00:02<00:00, 1.69it/s]

appdirs-1.4.4 | 13 KB | : 100% 1.0/1 [00:02<00:00, 1.60it/s]

gmp-6.2.1 | 806 KB | : 100% 1.0/1 [00:02<00:00, 2.66s/it]

gmp-6.2.1 | 806 KB | : 100% 1.0/1 [00:02<00:00, 2.66s/it]

mpfr-4.1.0 | 2.6 MB | : 100% 1.0/1 [00:03<00:00, 1.65it/s]

... (more hidden) ...

metis-5.1.0 | 4.1 MB | : 100% 1.0/1 [00:03<00:00, 1.55it/s]

pyfmi-2.9.8 | 12.7 MB | : 100% 1.0/1 [00:05<00:00, 1.14it/s]

scipy-1.10.0 | 23.5 MB | : 100% 1.0/1 [00:07<00:00, 1.42s/it]

libopenblas-0.3.21 | 10.1 MB | : 100% 1.0/1 [00:10<00:00, 22.04s/it]

libopenblas-0.3.21 | 10.1 MB | : 100% 1.0/1 [00:10<00:00, 22.04s/it]
icu-58.2 | 22.6 MB | : 100% 1.0/1 [00:11<00:00, 1.29s/it]


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

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

Cloning into 'BPL_TEST2_Batch'...

```
In [ ]: %cd BPL_TEST2_Batch

/content/BPL_TEST2_Batch/BPL_TEST2_Batch
```

```
In [1]: run -i BPL_TEST2_Batch_explore_me.py
```

Linux - run FMU pre-compiled OpenModelica 1.21.0

Model for bioreactor 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

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

Key system information is listed with the command system_info()

```
In [2]: fmu_model
```

```
Out[2]: 'xBPL_TEST2_Batch_linux_om_me.fmu'
```

```
In [3]: %matplotlib inline
plt.rcParams['figure.figsize'] = [25/2.54, 20/2.54]
```

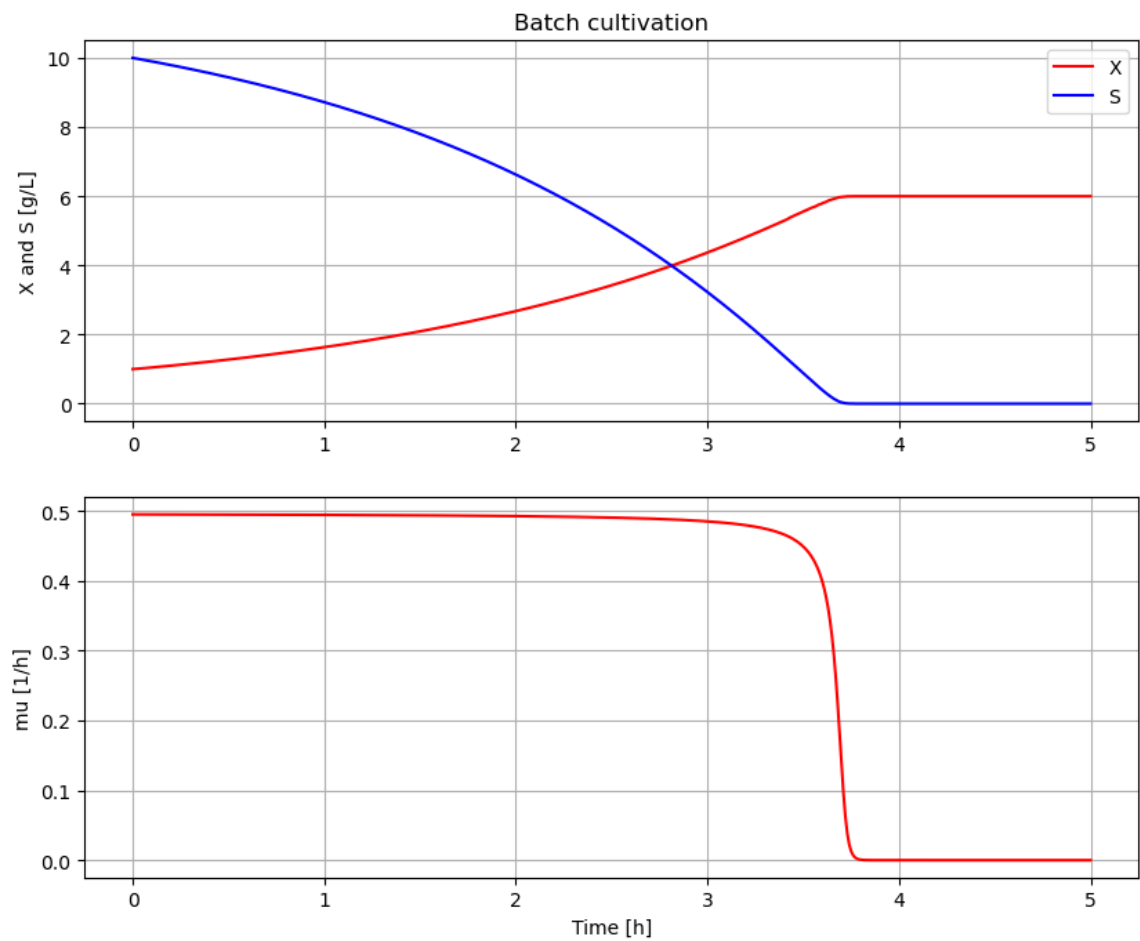
```
In [4]: import warnings
warnings.filterwarnings("ignore")
```

BPL_TEST2_Batch - demo

```
In [5]: describe('culture'); print(); #describe('liquidphase')
```

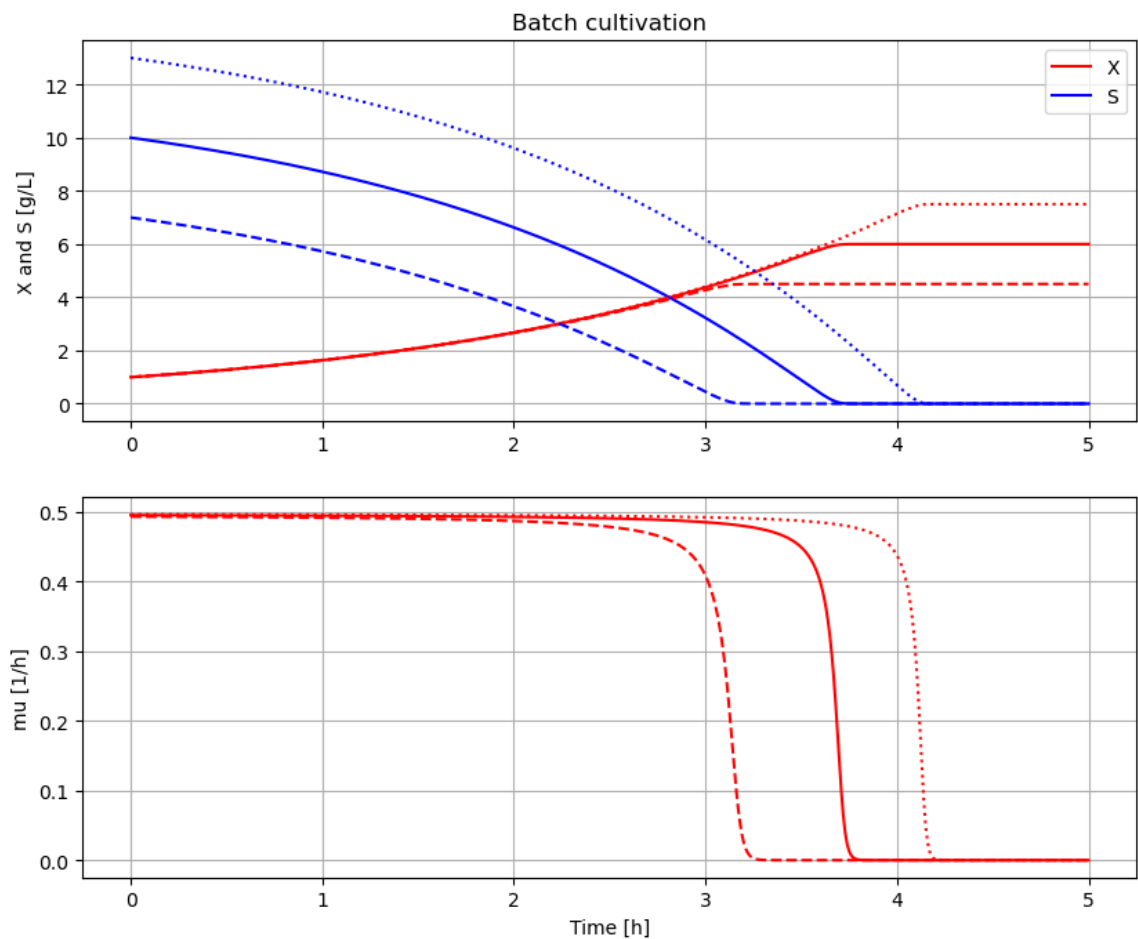
Simplified text book model - only substrate S and cell concentration X

```
In [6]: # Simulation with default values of the process
newplot(plotType='TimeSeries')
simu()
```



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

# Restore default value of VS_0
init(VS_0=10)
```

In [8]: `disp('culture')`

Y : 0.5
qSmax : 1.0
Ks : 0.1

In [9]: `describe('mu')`

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

In [10]: `describe('parts')`

['bioreactor', 'bioreactor.culture']

In [11]: `describe('MSL')`

MSL: 3.2.3 - used components: RealInput, RealOutput, CombiTimeTable, Types

In [12]: `system_info()`

System information

- OS: Linux
- Python: 3.8.16
- Scipy: not installed in the notebook
- PyFMI: 2.9.8
- FMU by: OpenModelica Compiler OpenModelica 1.21.0~dev-185-g9d983b8
- FMI: 2.0
- Type: FMUModelME2
- Name: BPL_TEST2.Batch
- Generated: 2023-01-19T09:34:26Z
- MSL: 3.2.3
- Description: Bioprocess Library version 2.1.1-beta
- Interaction: FMU-explore version 0.9.6

In []: