Open in Colab

BPL_TEST2_Chemostat script with PyFMI

The key library PyFMI is installed.

After the installation a small application BPL_TEST2_Chemostat 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 09:23:51--  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   137MB/s    in 1.0s

2025-03-26 09:23:52 (137 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): - ▒▒\ ▒▒| ▒▒/ ▒▒- ▒▒\ ▒▒| ▒▒/ ▒▒- ▒▒\
▒▒| ▒▒/ ▒▒- ▒▒done
Solving environment: | ▒▒/ ▒▒done

## 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-py311h06a4
308_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]

openssl-3.0.16       | 5.2 MB    | :   3% 0.029825939501620 64/1 [00:00<00:03,  3.41
s/it]
certifi-2025.1.31    | 163 KB    | :  98% 0.9840122040576089/1 [00:00<00:00,  9.57i
t/s]
certifi-2025.1.31    | 163 KB    | : 100% 1.0/1 [00:00<00:00,  9.57it/s]

ca-certificates-2025 | 129 KB    | : 100% 1.0/1 [00:00<00:00,  9.05it/s]

ca-certificates-2025 | 129 KB    | : 100% 1.0/1 [00:00<00:00,  9.05it/s]



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

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): - ▒▒\ ▒▒| ▒▒/ ▒▒- ▒▒\ ▒▒| ▒▒/ ▒▒- ▒▒\
▒▒| ▒▒/ ▒▒- ▒▒\ ▒▒| ▒▒/ ▒▒- ▒▒\ ▒▒| ▒▒/ ▒▒- ▒▒\ ▒▒| ▒▒/ ▒▒- ▒▒\ ▒▒| ▒▒/ ▒▒- ▒▒\ ▒▒|
▒▒/ ▒▒- ▒▒\ ▒▒| ▒▒/ ▒▒- ▒▒\ ▒▒| ▒▒/ ▒▒- ▒▒\ ▒▒| ▒▒/ ▒▒- ▒▒done
Solving environment: | ▒▒/ ▒▒- ▒▒\ ▒▒done

## 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
    libcblas-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
  libcblas           conda-forge/linux-64::libcblas-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_7100
102
  libumfpack         conda-forge/linux-64::libumfpack-6.3.5-heb53515_7100102
  metis              conda-forge/linux-64::metis-5.1.0-hd0bcaf9_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-2
5.1.1-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]

libspqr-4.3.4         | 213 KB    | :   0% 0/1 [00:00<?, ?it/s]

 ... (more hidden) ...
scipy-1.15.2          | 16.4 MB   | :   0% 0.0009529389827073913/1 [00:00<01:52, 112.
89s/it]

libopenblas-0.3.29    | 5.6 MB    | :   0% 0.0027679004637044184/1 [00:00<00:40, 40.3
4s/it]

metis-5.1.0           | 3.7 MB    | :   0% 0.004175799528999174/1 [00:00<00:26, 26.13
s/it]

pyfmi-2.16.3          | 5.2 MB    | :   0% 0.002983953056648666/1 [00:00<00:38, 38.41
s/it]
scipy-1.15.2          | 16.4 MB   | :  13% 0.1324585185963274/1 [00:00<00:01,  1.33s/
it]

libopenblas-0.3.29    | 5.6 MB    | :  45% 0.4483998751201158/1 [00:00<00:00,  2.51i
```

```
t/s]

pyfmi-2.16.3          | 5.2 MB    | :  45% 0.45356086461059725/1 [00:00<00:00,  2.51i
t/s]


metis-5.1.0           | 3.7 MB    | :  48% 0.4843927453639042/1 [00:00<00:00,  2.65i
t/s]
scipy-1.15.2          | 16.4 MB   | :  41% 0.4097637625641783/1 [00:00<00:00,  1.64i
t/s]


metis-5.1.0           | 3.7 MB    | : 100% 1.0/1 [00:00<00:00,  2.82it/s]


scipy-1.15.2          | 16.4 MB   | :  65% 0.6508573251891483/1 [00:00<00:00,  1.84i
t/s]



libstdcxx-14.2.0      | 3.7 MB    | :   0% 0.0042177278432850495/1 [00:00<01:46, 107.
05s/it]

libopenblas-0.3.29    | 5.6 MB    | : 100% 1.0/1 [00:00<00:00,  2.15it/s]

libopenblas-0.3.29    | 5.6 MB    | : 100% 1.0/1 [00:00<00:00,  2.15it/s]


pyfmi-2.16.3          | 5.2 MB    | : 100% 1.0/1 [00:00<00:00,  2.17it/s]


scipy-1.15.2          | 16.4 MB   | :  90% 0.903386155606607/1 [00:00<00:00,  2.01it/
s]




libgfortran5-14.2.0   | 1.4 MB    | :   1% 0.011206734985068174/1 [00:00<00:47, 48.22
s/it]



libstdcxx-14.2.0      | 3.7 MB    | :  92% 0.923682397679426/1 [00:00<00:00,  2.19it/
s]
```

```
openssl-3.4.1        | 2.8 MB    | :   1% 0.0055741049077571376/1 [00:00<01:40, 100.
66s/it]
```

```
libgfortran5-14.2.0  | 1.4 MB    | : 100% 1.0/1 [00:00<00:00, 48.22s/it]
numpy-2.2.4          | 8.6 MB    | : 100% 1.0/1 [00:00<00:00,  2.92it/s]
```

```
conda-25.1.1         | 1.1 MB    | :   1% 0.013622478419712683/1 [00:00<00:49, 50.46
s/it]
```

```
libstdcxx-14.2.0     | 3.7 MB    | : 100% 1.0/1 [00:00<00:00,  2.19it/s]
```

```
assimulo-3.6.0       | 1.1 MB    | :   1% 0.014703493605362324/1 [00:00<00:49, 50.61
s/it]
```

```
conda-25.1.1         | 1.1 MB    | : 100% 1.0/1 [00:00<00:00, 50.46s/it]
```

```
openssl-3.4.1        | 2.8 MB    | : 100% 1.0/1 [00:00<00:00,  1.66it/s]
```

```
openssl-3.4.1        | 2.8 MB    | : 100% 1.0/1 [00:00<00:00,  1.66it/s]
```

```
libcholmod-5.3.1      | 1.1 MB    | :   1% 0.014870549794649543/1 [00:00<00:53, 54.72
s/it]

assimulo-3.6.0        | 1.1 MB    | : 100% 1.0/1 [00:00<00:00, 50.61s/it]

sundials-7.1.1        | 907 KB    | :   2% 0.01763373830085844/1 [00:00<00:46, 47.20
s/it]

libgcc-14.2.0         | 828 KB    | :   2% 0.01932337522187561/1 [00:00<00:42, 43.53
s/it]
```

```
mpfr-4.2.1           | 620 KB    | :   3% 0.025811696239942908/1 [00:00<00:32, 33.82
s/it]

libcholmod-5.3.1     | 1.1 MB    | : 100% 1.0/1 [00:00<00:00, 54.72s/it]

libgcc-14.2.0        | 828 KB    | : 100% 1.0/1 [00:00<00:00, 43.53s/it]

sundials-7.1.1       | 907 KB    | : 100% 1.0/1 [00:00<00:00, 47.20s/it]

mpfr-4.2.1           | 620 KB    | : 100% 1.0/1 [00:00<00:00, 33.82s/it]
```

```
gmp-6.3.0            | 449 KB    | :   4% 0.03561313321233331/1 [00:00<00:25, 26.35
s/it]
```

```
libumfpack-6.3.5     | 424 KB    | :   4% 0.037731330084655984/1 [00:00<00:24, 25.25
s/it]
```

```
libgomp-14.2.0       | 449 KB    | :   4% 0.03562807972826631/1 [00:00<00:25, 26.91
s/it]
```

```
gmp-6.3.0            | 449 KB    | : 100% 1.0/1 [00:00<00:00, 26.35s/it]
```

```
libumfpack-6.3.5     | 424 KB    | : 100% 1.0/1 [00:00<00:00, 25.25s/it]

libgomp-14.2.0       | 449 KB    | : 100% 1.0/1 [00:00<00:00, 26.91s/it]

fmilib-2.4.1         | 383 KB    | :   4% 0.04180391656566945/1 [00:00<00:22, 23.58
s/it]
```

```
fmilib-2.4.1         | 383 KB    | : 100% 1.0/1 [00:00<00:00, 23.58s/it]

 ... (more hidden) ...

libspqr-4.3.4        | 213 KB    | :   8% 0.07503068271326775/1 [00:01<00:12, 13.99
s/it]
```

```
 ... (more hidden) ...
```

```
scipy-1.15.2         | 16.4 MB   | : 100% 1.0/1 [00:01<00:00,  2.01it/s]
pyfmi-2.16.3         | 5.2 MB    | : 100% 1.0/1 [00:01<00:00,  2.17it/s]
metis-5.1.0          | 3.7 MB    | : 100% 1.0/1 [00:01<00:00,  2.82it/s]
libgfortran5-14.2.0  | 1.4 MB    | : 100% 1.0/1 [00:01<00:00,  1.25s/it]
```


```
libgfortran5-14.2.0  | 1.4 MB    | : 100% 1.0/1 [00:01<00:00,  1.25s/it]
```


```
libopenblas-0.3.29   | 5.6 MB    | : 100% 1.0/1 [00:01<00:00,  2.15it/s]
libstdcxx-14.2.0     | 3.7 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,  2.14s/it]

conda-25.1.1          | 1.1 MB    | : 100% 1.0/1 [00:02<00:00,  2.14s/it]

openssl-3.4.1         | 2.8 MB    | : 100% 1.0/1 [00:02<00:00,  1.66it/s]

assimulo-3.6.0        | 1.1 MB    | : 100% 1.0/1 [00:02<00:00,  2.53s/it]

assimulo-3.6.0        | 1.1 MB    | : 100% 1.0/1 [00:02<00:00,  2.53s/it]

libcholmod-5.3.1      | 1.1 MB    | : 100% 1.0/1 [00:02<00:00,  2.55s/it]
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libcholmod-5.3.1     | 1.1 MB    | : 100% 1.0/1 [00:02<00:00,  2.55s/it]
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libgcc-14.2.0        | 828 KB    | : 100% 1.0/1 [00:02<00:00,  2.64s/it]
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libgcc-14.2.0        | 828 KB    | : 100% 1.0/1 [00:02<00:00,  2.64s/it]
numpy-2.2.4          | 8.6 MB    | : 100% 1.0/1 [00:03<00:00,  2.92it/s]
```

```
sundials-7.1.1       | 907 KB    | : 100% 1.0/1 [00:03<00:00,  2.82s/it]
```


```
sundials-7.1.1       | 907 KB    | : 100% 1.0/1 [00:03<00:00,  2.82s/it]
```

```
gmp-6.3.0            | 449 KB    | : 100% 1.0/1 [00:03<00:00,  2.83s/it]
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gmp-6.3.0            | 449 KB    | : 100% 1.0/1 [00:03<00:00,  2.83s/it]
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```
mpfr-4.2.1           | 620 KB    | : 100% 1.0/1 [00:03<00:00,  2.85s/it]
```


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mpfr-4.2.1           | 620 KB    | : 100% 1.0/1 [00:03<00:00,  2.85s/it]
```

```
libumfpack-6.3.5     | 424 KB    | : 100% 1.0/1 [00:03<00:00,  2.86s/it]
```


```
libumfpack-6.3.5     | 424 KB    | : 100% 1.0/1 [00:03<00:00,  2.86s/it]
```


```
libgomp-14.2.0       | 449 KB    | : 100% 1.0/1 [00:03<00:00,  2.91s/it]
```


```
libgomp-14.2.0       | 449 KB    | : 100% 1.0/1 [00:03<00:00,  2.91s/it]
```

```
fmilib-2.4.1         | 383 KB    | : 100% 1.0/1 [00:03<00:00,  2.92s/it]
```


```
fmilib-2.4.1         | 383 KB    | : 100% 1.0/1 [00:03<00:00,  2.92s/it]
```


```
 ... (more hidden) ...
```

```
 ... (more hidden) ...
```

```
libspqr-4.3.4        | 213 KB    | : 100% 1.0/1 [00:03<00:00,  2.98s/it]
```

```
scipy-1.15.2         | 16.4 MB   | : 100% 1.0/1 [00:04<00:00,  2.01it/s]
```

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

Now specific installation run a simulation and notebook for that

Start with connecting to Github. Then upload the two files:

- FMU - BPL_TEST2_Chemostat_linux_om_me.fmu
- Setup-file - BPL_TEST2_Chemostat_explore.py

In [9]:
```
# Filter out DepracationWarnings for 'np.float as alias' is needed - wish I could m
import warnings
warnings.filterwarnings("ignore")
```

In [10]:
```
%%bash
git clone https://github.com/janpeter19/BPL_TEST2_Chemostat
```

```
Cloning into 'BPL_TEST2_Chemostat'...
```

In [11]:
```
%cd BPL_TEST2_Chemostat
```

```
/content/BPL_TEST2_Chemostat
```

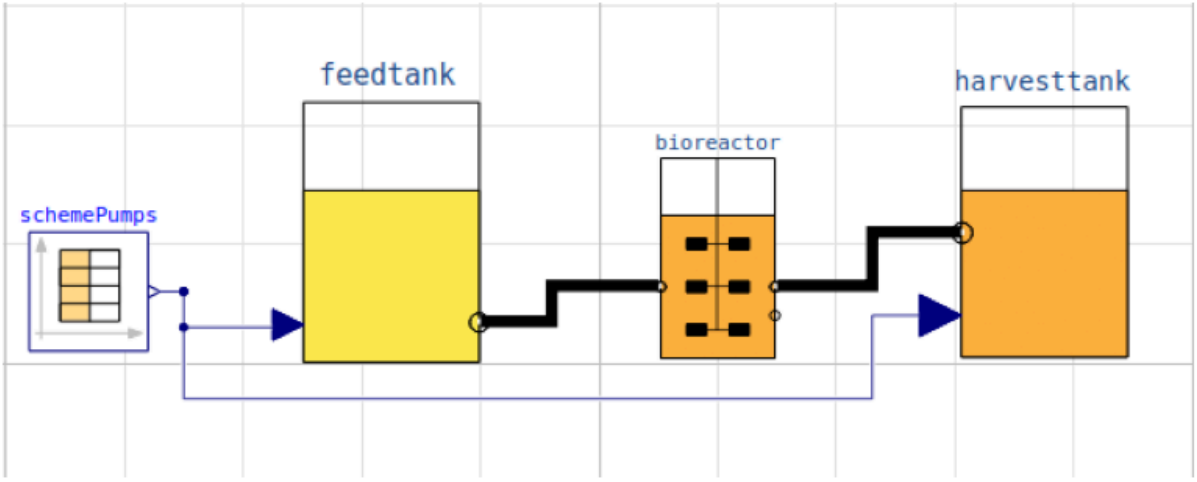
In [12]:
```
run -i BPL_TEST2_Chemostat_explore.py
```

```
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 [13]:
```
%matplotlib inline
plt.rcParams['figure.figsize'] = [25/2.54, 20/2.54]
```

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

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

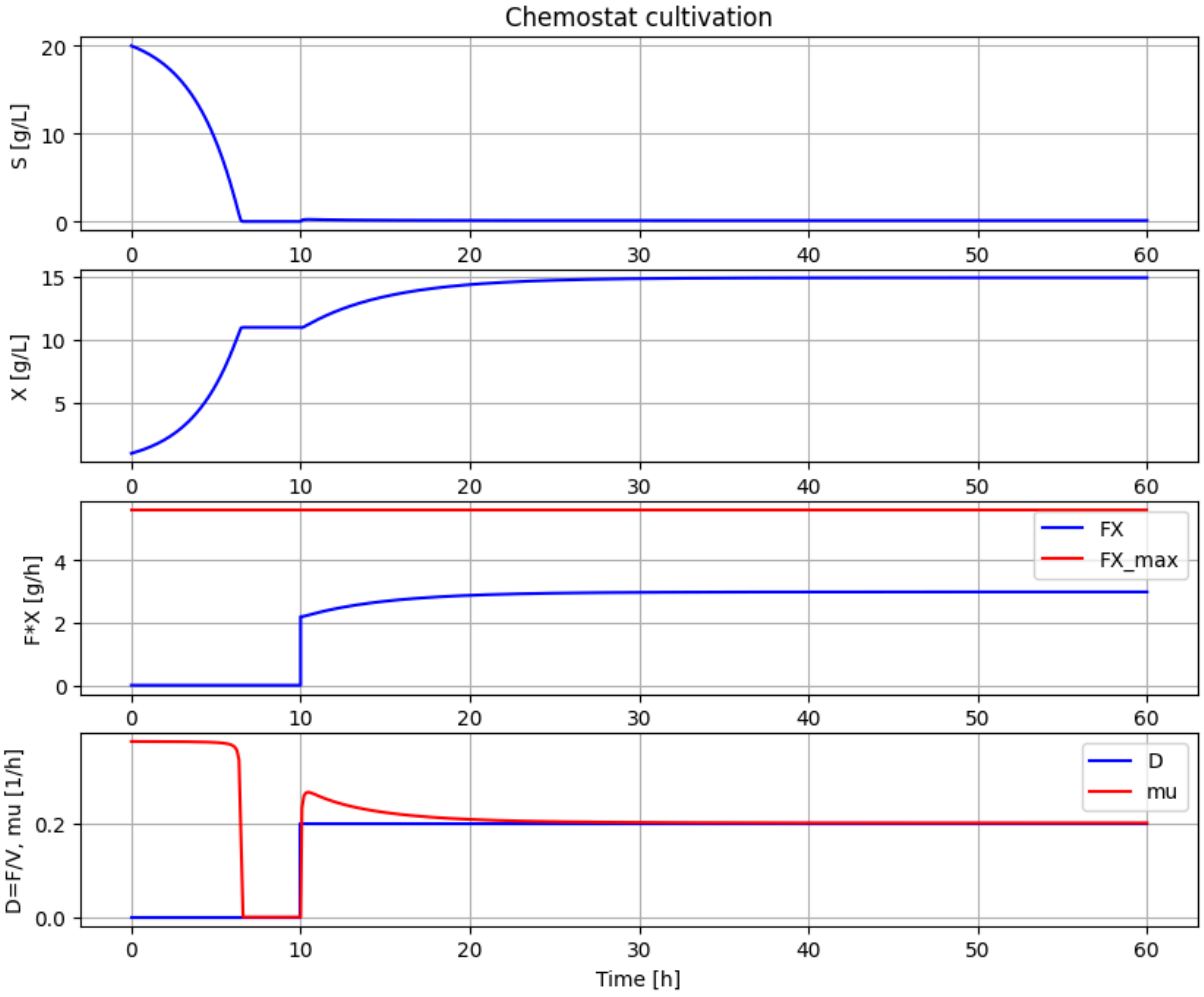


In [15]:
```
describe('culture')
```

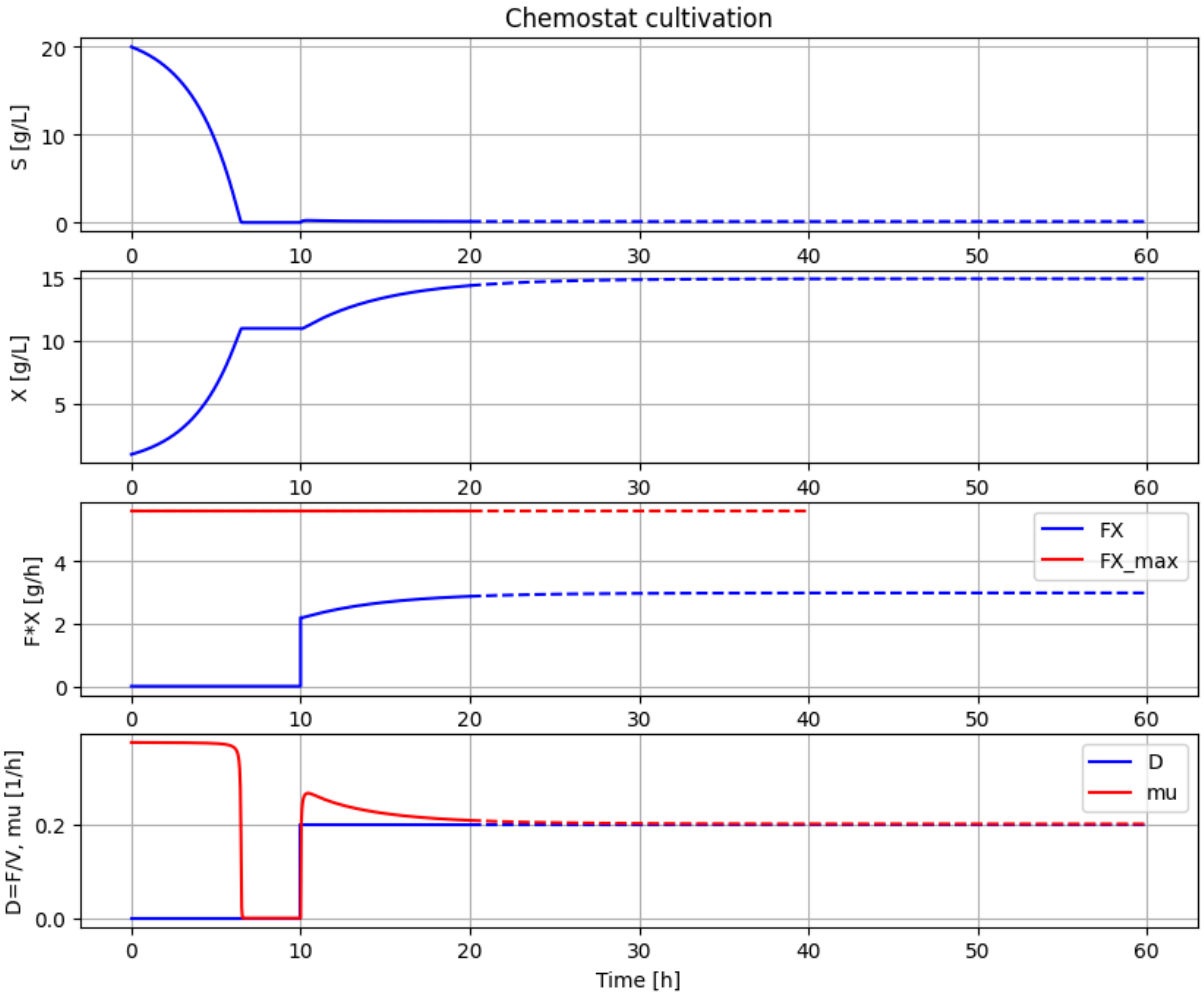
```
Simplified text book model - only substrate S and cell concentration X
```

In [16]:
```
newplot()
par(Y=0.50, qSmax=0.75,  Ks=0.1)              # Culture parameters
init(V_start=1.0, VX_start=1.0, VS_start=20)  # Bioreactor startup
par(S_in=30, t0=0, F0=0, t1=10, F1=0.2)       # Substrate feeding
simu(60)
```

```
Could not find cannot import name 'dopri5' from 'assimulo.lib' (/usr/local/lib/pytho
n3.11/site-packages/assimulo/lib/__init__.py)
Could not find cannot import name 'rodas' from 'assimulo.lib' (/usr/local/lib/python
3.11/site-packages/assimulo/lib/__init__.py)
Could not find cannot import name 'odassl' from 'assimulo.lib' (/usr/local/lib/pytho
n3.11/site-packages/assimulo/lib/__init__.py)
Could not find ODEPACK functions.
Could not find RADAR5
Could not find GLIMDA.
```



In [17]:
```
# Check simu('cont')
newplot()
simu(20)
simu(40,'cont')
```



In [18]:
```
# The maximal biomass productivity FX_max [g/h] marked red in the diagram above
# can be calculated for CSTR from the FMU and is
cstrProdMax(model)
```

Out[18]: np.float64(5.625)

In [19]:
```
describe('cstrProdMax')
```

```
Calculate from the model maximal chemostat productivity FX_max : 5.625 [ g/h ]
```

In [20]:
```
describe('parts')
```

```
['bioreactor', 'bioreactor.culture', 'D', 'feedtank', 'harvesttank', 'schemePumps']
```

In [21]:
```
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.Chemostat
 -Generated: 2024-11-06T21:37:41Z
 -MSL: 3.2.3
 -Description: Bioprocess Library version 2.3.0
 -Interaction: FMU-explore version 1.0.0
```

In [21]: