



OPMRUN

Graphical User Interface

For

OPM Flow

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Graphical User Interface For OPM Flow

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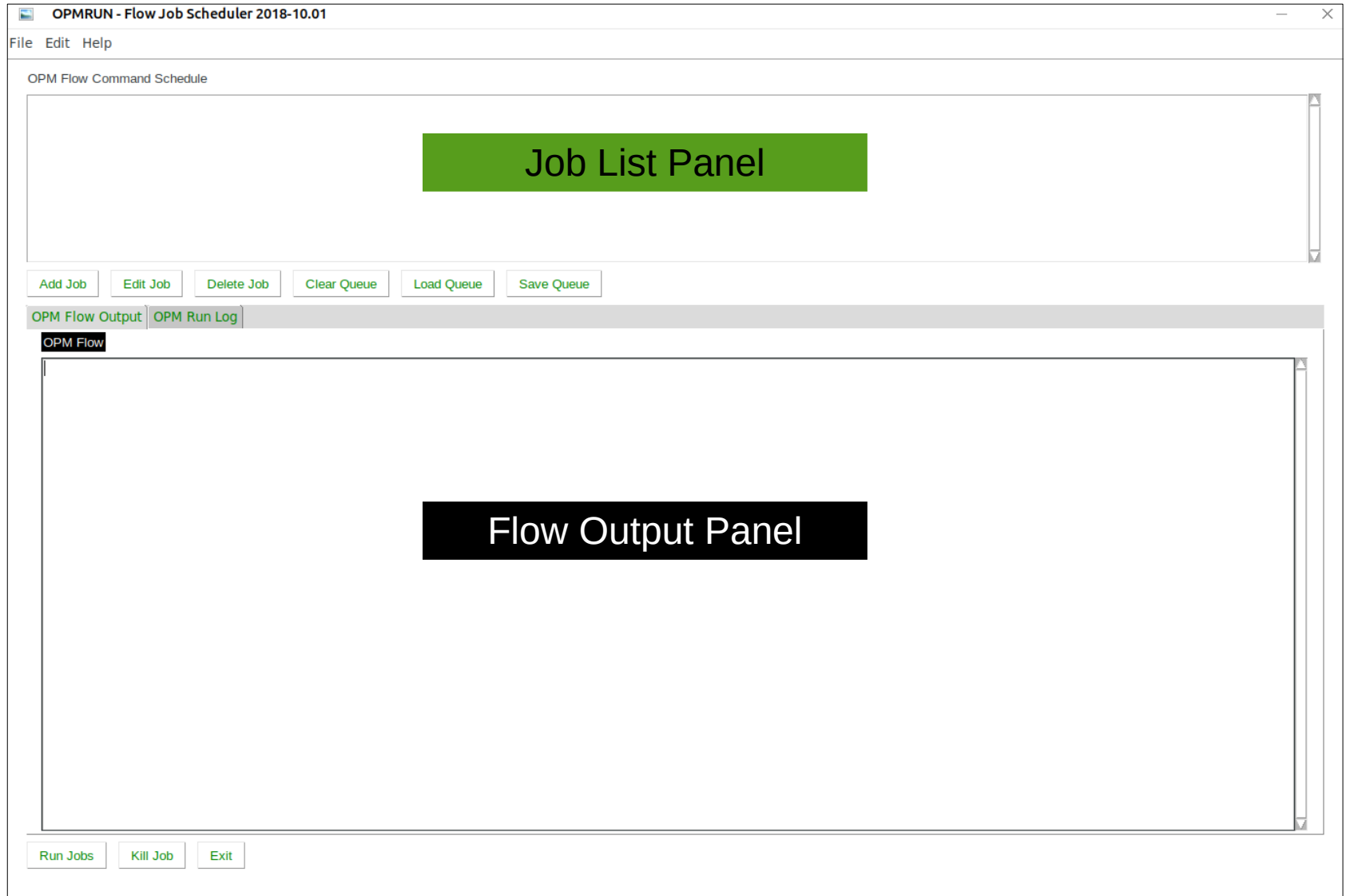
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Date	Revision	Description	Prepared	Checked	Approved
2018-11-25	Rev-0	Initial Release	D. Baxendale	N/A	N/A

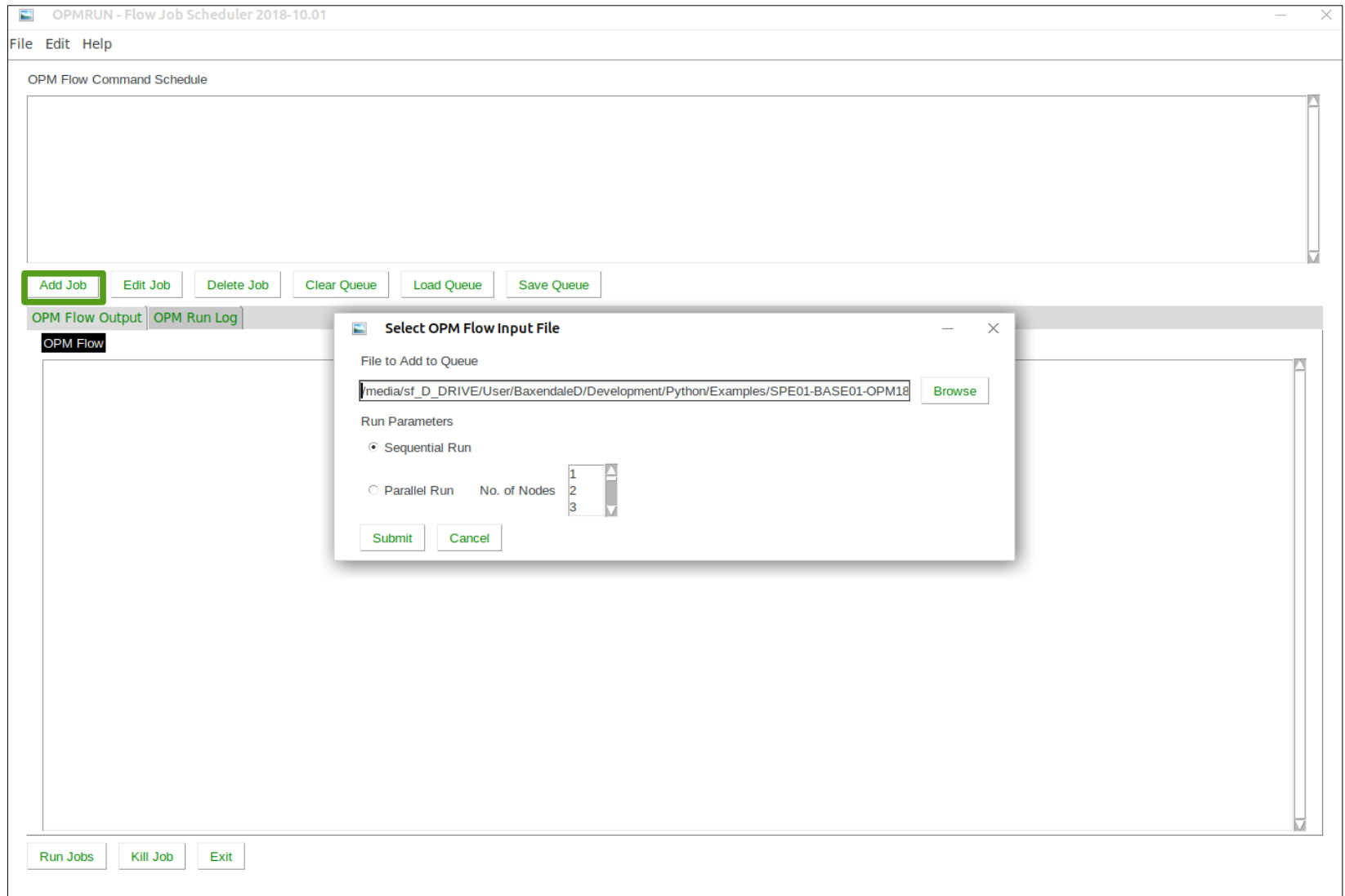
E I P C OPMRUN:What Is It?

- A graphical user interface to OPM Flow that has similar functionality to the commercial simulator's ECLRUN program.
- Target audience are Reservoir Engineers in a production environment. Developers and experienced Linux users will already have compatible work flows.
- Allows editing and management of OPM Flow's run time parameters. Default parameters are automatically loaded from Flow, and the user can reset the default set either from a parameter or PRT file.
- Allows simulation jobs to be queued and run. Queue can be set to run in NOSIM mode or RUN mode.
- Queues can be edited, saved and loaded.
- Written in Python 3 and tested under Unbuntu-Mate 18.04 TLS.

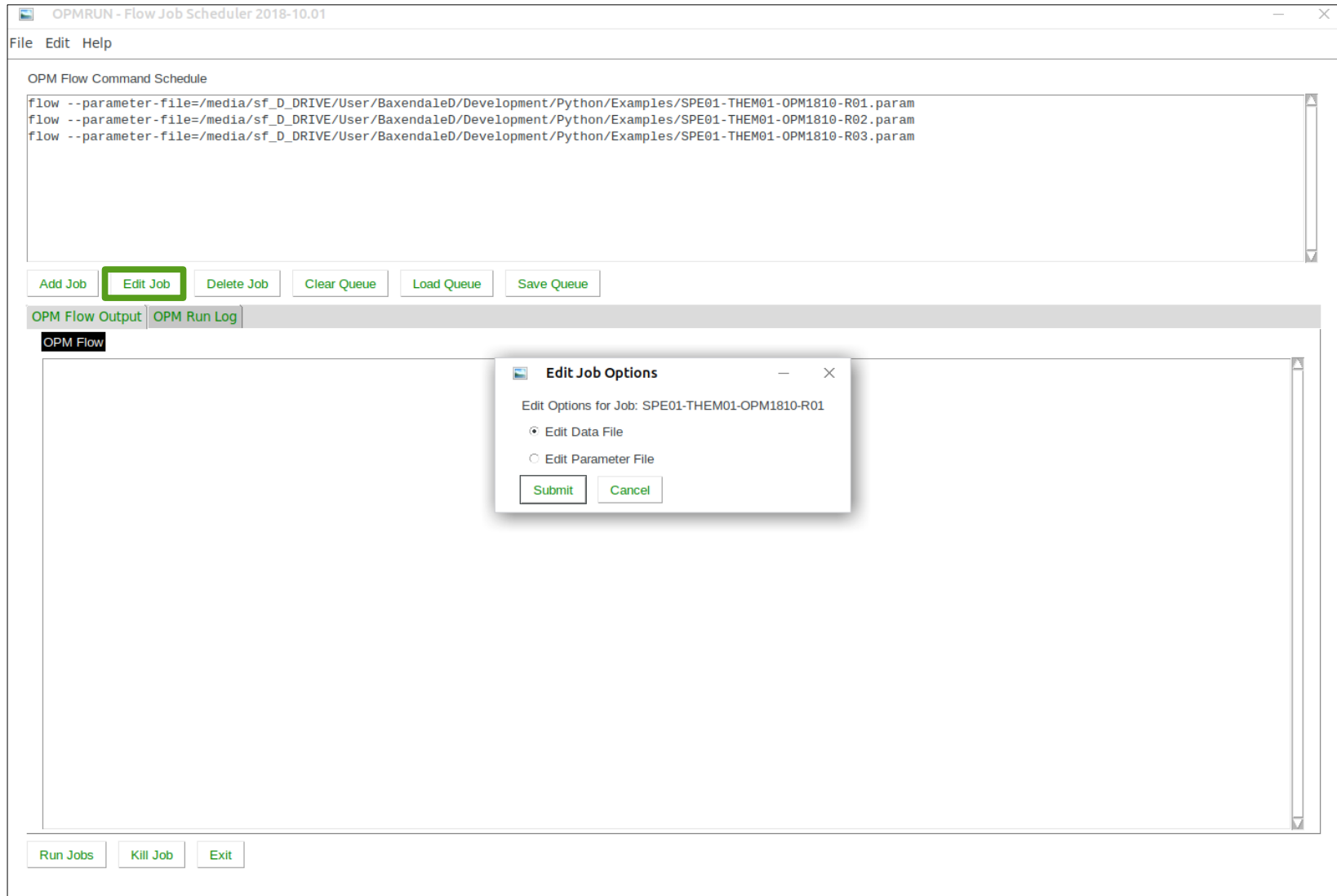
EIPC OPMRUN: Simple And Clean Interface



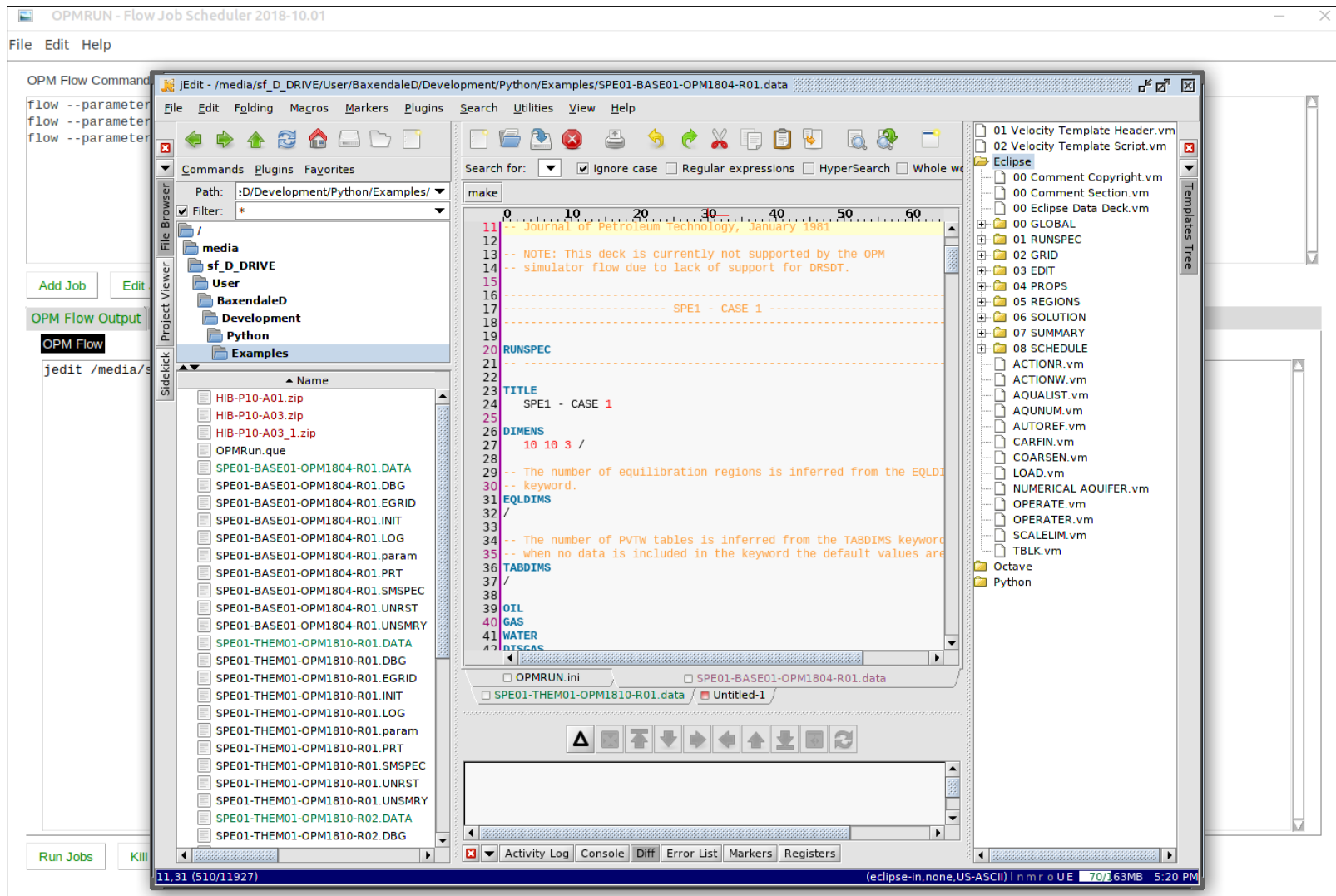
E I P C OPMRUN: Add Job And Select Run Type



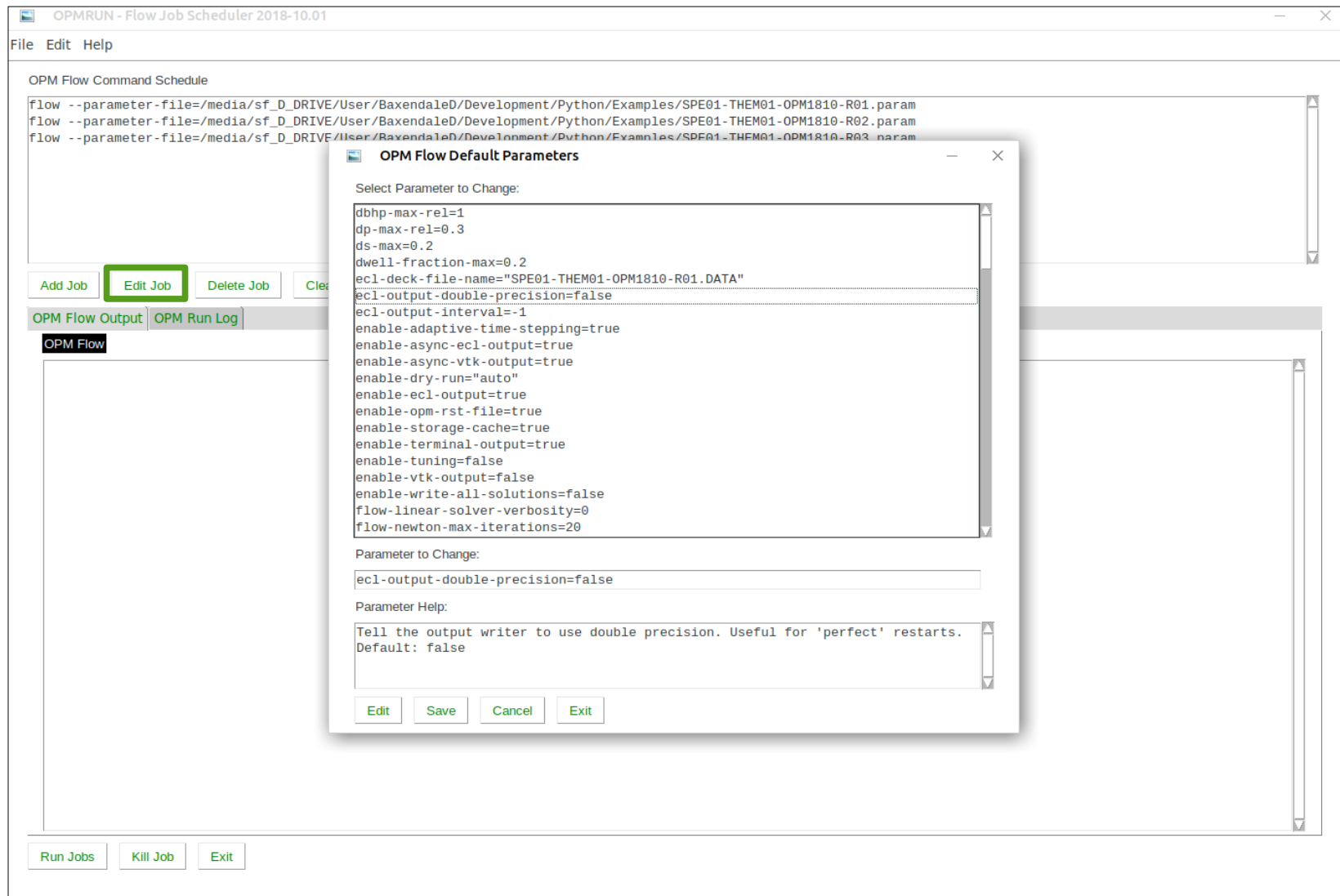
E I P C OPMRUN: Edit Job Data & Parameter File



EIPC OPMRUN: Edit Data File



E I P C OPMRUN: Edit Parameter File With Help



E I P C OPMRUN: Run Jobs In Queue Options

OPMRUN - Flow Job Scheduler 2018-10.01

File Edit Help

OPM Flow Command Schedule

```
flow --parameter-file=/media/sf_D_DRIVE/User/BaxendaleD/Development/Python/Examples/SPE01-THEM01-OPM1810-R01.param
flow --parameter-file=/media/sf_D_DRIVE/User/BaxendaleD/Development/Python/Examples/SPE01-THEM01-OPM1810-R02.param
flow --parameter-file=/media/sf_D_DRIVE/User/BaxendaleD/Development/Python/Examples/SPE01-THEM01-OPM1810-R03.param
```

Add Job Edit Job Delete Job Clear Queue Load Queue Save Queue

OPM Flow Output OPM Run Log

OPM Flow

==== Simulation turned off =====

Process Complete

flow --parameter-file=SPE01-THEM01-OPM1810-R02.param --enable-dry-run="true" | tee SPE01-THEM01-OPM1810-R02.LOG

Current Working Directory /media/sf_D_DRIVE/User/BaxendaleD/Development/Python/Examples

flow --parameter-file=SPE01-THEM01-OPM1810-R02.param --enable-dry-run="true" | tee SPE01-THEM01-OPM1810-R02.LOG

* This is flow 2018.10 *

* Flow is a simulator for fully implicit three-phase black-oil flow, *

* including solvent and polymer capabilities. *

* For more information, see <https://opm-project.org> *

Process Complete

flow --parameter-file=SPE01-THEM01-OPM1810-R03.param --enable-dry-run="true" | tee SPE01-THEM01-OPM1810-R03.LOG

Current Working Directory /media/sf_D_DRIVE/User/BaxendaleD/Development/Python/Examples

flow --parameter-file=SPE01-THEM01-OPM1810-R03.param --enable-dry-run="true" | tee SPE01-THEM01-OPM1810-R03.LOG

* This is flow 2018.10 *

* Flow is a simulator for fully implicit three-phase black-oil flow, *

* including solvent and polymer capabilities. *

* For more information, see <https://opm-project.org> *

Process Complete

Run Jobs Kill Job Exit

Select Run Option

Selection the Run Option for All 3 Cases in Queue?

☒ Run in No Simulation Mode

☐ Run in Standard Simulation Mode

Submit Cancel

Flow output, notice the created log file for the run.

E I P C OPMRUN: Run Jobs In Queue Options

The screenshot displays the OPMRUN - Flow Job Scheduler 2018-10.01 application window. The main window has a menu bar (File, Edit, Help) and a toolbar with buttons: Add Job, Edit Job, Delete Job, Clear Queue, Load Queue, and Save Queue. Below the toolbar are two tabs: OPM Flow Output and OPM Run Log. The OPM Flow Output tab is active, showing a list of jobs in the queue. A dialog box titled 'Select Run Option' is open, asking for the run option for all 3 cases in the queue. The dialog has two radio buttons: 'Run in No Simulation Mode' and 'Run in Standard Simulation Mode'. The 'Run in Standard Simulation Mode' option is selected. The dialog also has 'Submit' and 'Cancel' buttons. The background window shows the following text:

```
OPM Flow Command Schedule

flow --parameter-file=/media/sf_D_DRIVE/User/BaxendaleD/Development/Python/Examples/SPE01-THEM01-OPM1810-R01.param
flow --parameter-file=/media/sf_D_DRIVE/User/BaxendaleD/Development/Python/Examples/SPE01-THEM01-OPM1810-R02.param
flow --parameter-file=/media/sf_D_DRIVE/User/BaxendaleD/Development/Python/Examples/SPE01-THEM01-OPM1810-R03.param
```

OPM Flow Output | OPM Run Log

OPM Flow

```
Time step summary: well its = 2, newton its = 3, linearizations = 4 ( 0.009 sec), linear its = 25 ( 0.004 sec)
Report step 118/120 at day 3589/3650, date = 29-Oct-2024

Time step 0, stepsize 30 days.
Switching control mode for well PROD from SURFACE_RATE to BHP
Time step summary: well its = 2, newton its = 3, linearizations = 4 ( 0.009 sec), linear its = 25 ( 0.004 sec)
Report step 119/120 at day 3619/3650, date = 28-Nov-2024

Time step 0, stepsize 31 days.
Switching control mode for well PROD from SURFACE_RATE to BHP
Time step summary: well its = 2, newton its = 3, linearizations = 4 ( 0.009 sec), linear its = 25 ( 0.004 sec)

===== End of simulation =====

Total time (seconds):      8.02436
Solver time (seconds):     4.46095
Assembly time (seconds):   2.07065 (Failed: 0; 0%)
Linear solve time (seconds): 1.25567 (Failed: 0; 0%)
Update time (seconds):     0.682091 (Failed: 0; 0%)
Output write time (seconds): 3.38085
Overall Well Iterations:   138 (Failed: 0; 0%)
Overall Linearizations:    656 (Failed: 0; 0%)
Overall Newton Iterations: 533 (Failed: 0; 0%)
Overall Linear Iterations: 4303 (Failed: 0; 0%)

Process Complete
```

At the bottom of the window are three buttons: Run Jobs, Kill Job, and Exit.

Select Run Option

Selection the Run Option for All 3 Cases in Queue?

☐ Run in No Simulation Mode

☒ Run in Standard Simulation Mode

Submit Cancel

0.003 sec)

0.005 sec)

Simple selection to switch from NOSIM mode to RUN mode for all jobs in the queue.

E I P C OPMRUN: Schedule Log For Tracking Progress

OPMRUN - Flow Job Scheduler 2018-10.01

File Edit Help

OPM Flow Command Schedule

```
flow --parameter-file=/media/sf_D_DRIVE/User/BaxendaleD/Development/Python/Examples/SPE01-THEM01-OPM1810-R01.param
flow --parameter-file=/media/sf_D_DRIVE/User/BaxendaleD/Development/Python/Examples/SPE01-THEM01-OPM1810-R02.param
flow --parameter-file=/media/sf_D_DRIVE/User/BaxendaleD/Development/Python/Examples/SPE01-THEM01-OPM1810-R03.param
```

Add Job Edit Job Delete Job Clear Queue Load Queue Save Queue

OPM Flow Output OPM Run Log

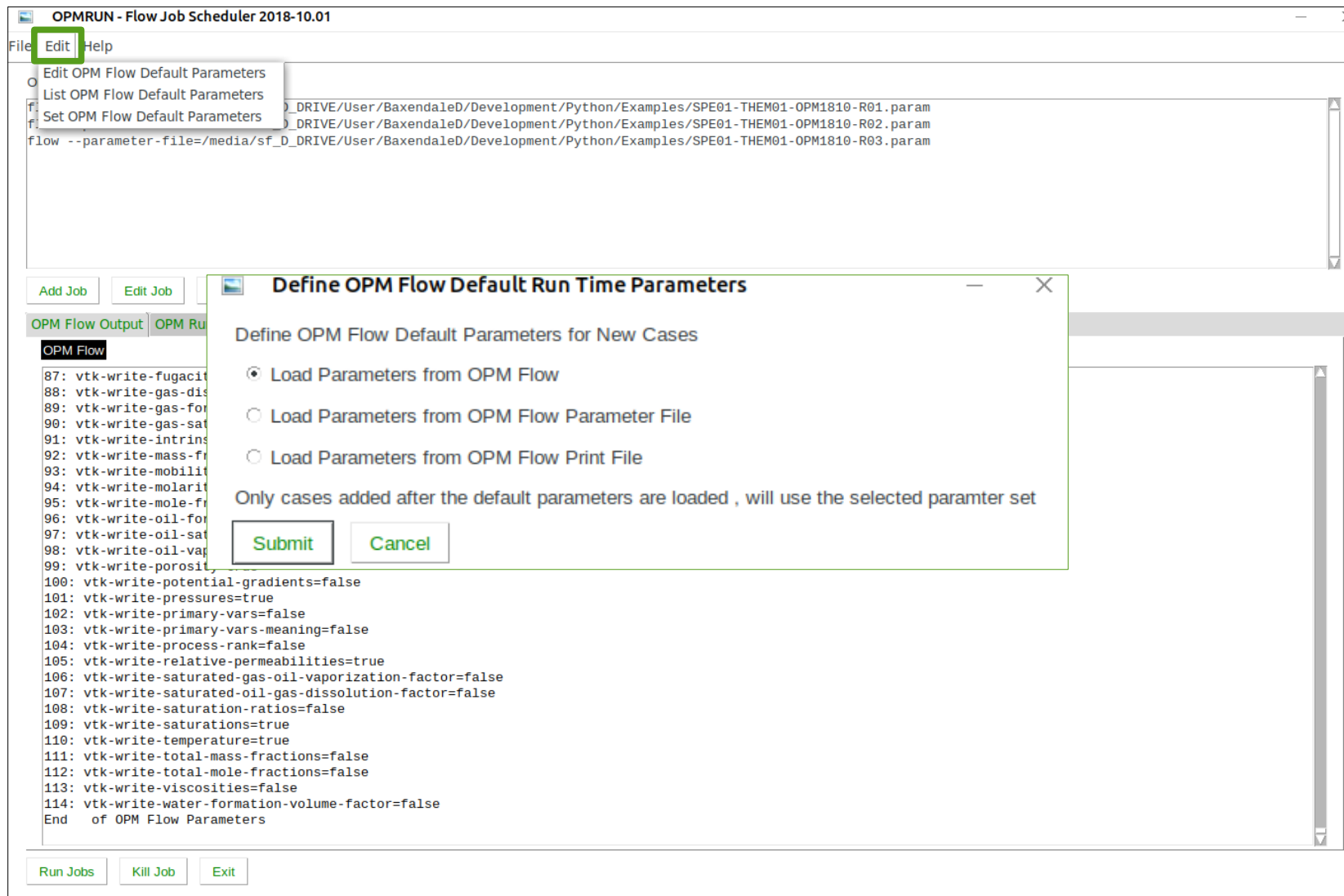
OPM Run

```
2018-11-23 17:35:42: Overall Well Iterations:      138 (Failed: 0; 0%)
2018-11-23 17:35:42: Overall Linearizations:       656 (Failed: 0; 0%)
2018-11-23 17:35:42: Overall Newton Iterations:    533 (Failed: 0; 0%)
2018-11-23 17:35:42: Overall Linear Iterations:    4303 (Failed: 0; 0%)
2018-11-23 17:35:42: End Job: flow --parameter-file=SPE01-THEM01-OPM1810-R02.param | tee SPE01-THEM01-OPM1810-R02.LOG
2018-11-23 17:35:42: Completed Job No. 2
2018-11-23 17:35:42:
2018-11-23 17:35:42: Run Job 3 of 3
2018-11-23 17:35:42: Start Job: flow --parameter-file=SPE01-THEM01-OPM1810-R03.param | tee SPE01-THEM01-OPM1810-R03.LOG
2018-11-23 17:35:42: Removing Existing Output Files
2018-11-23 17:35:42: rm SPE01-THEM01-OPM1810-R03.DBG
2018-11-23 17:35:42: rm SPE01-THEM01-OPM1810-R03.EGRID
2018-11-23 17:35:42: rm SPE01-THEM01-OPM1810-R03.INIT
2018-11-23 17:35:42: rm SPE01-THEM01-OPM1810-R03.LOG
2018-11-23 17:35:42: rm SPE01-THEM01-OPM1810-R03.PRT
2018-11-23 17:35:42: Simulation Started
2018-11-23 17:35:50: Total time (seconds):          8.02436
2018-11-23 17:35:50: Solver time (seconds):         4.46095
2018-11-23 17:35:50: Assembly time (seconds):       2.07065 (Failed: 0; 0%)
2018-11-23 17:35:50: Linear solve time (seconds):    1.25567 (Failed: 0; 0%)
2018-11-23 17:35:50: Update time (seconds):         0.682091 (Failed: 0; 0%)
2018-11-23 17:35:50: Output write time (seconds):    3.38085
2018-11-23 17:35:50: Overall Well Iterations:      138 (Failed: 0; 0%)
2018-11-23 17:35:50: Overall Linearizations:       656 (Failed: 0; 0%)
2018-11-23 17:35:50: Overall Newton Iterations:    533 (Failed: 0; 0%)
2018-11-23 17:35:50: Overall Linear Iterations:    4303 (Failed: 0; 0%)
2018-11-23 17:35:50: End Job: flow --parameter-file=SPE01-THEM01-OPM1810-R03.param | tee SPE01-THEM01-OPM1810-R03.LOG
2018-11-23 17:35:50: Completed Job No. 3
2018-11-23 17:35:50:
```

Run Jobs Kill Job Exit

Notice how the software cleans up the previous runs with the same name.

E I P C OPMRUN: Set Parameter Default Options



E I P C OPMRUN: Manual Available

OPMRUN - Flow Job Scheduler 2018-10.01

File Edit Help

OPM Flow Manual

flow --parameter-file=/media/sf_D_DRIVE/User/Baxenda

flow --parameter-file=/media/sf_D_DRIVE/User/Baxenda

flow --parameter-file=/media/sf_D_DRIVE/User/Baxenda

Add Job Edit Job Delete Job Clear Queue Load

OPM Flow Output OPM Run Log

OPM Flow

```

88: vtk-write-gas-dissolution-factor=false
89: vtk-write-gas-formation-volume-factor=false
90: vtk-write-gas-saturation-pressure=false
91: vtk-write-intrinsic-permeabilities=false
92: vtk-write-mass-fractions=false
93: vtk-write-mobilities=false
94: vtk-write-molarities=false
95: vtk-write-mole-fractions=true
96: vtk-write-oil-formation-volume-factor=false
97: vtk-write-oil-saturation-pressure=false
98: vtk-write-oil-vaporization-factor=false
99: vtk-write-porosity=true
100: vtk-write-potential-gradients=false
101: vtk-write-pressures=true
102: vtk-write-primary-vars=false
103: vtk-write-primary-vars-meaning=false
104: vtk-write-process-rank=false
105: vtk-write-relative-permeabilities=true
106: vtk-write-saturated-gas-oil-vaporization-fact
107: vtk-write-saturated-oil-gas-dissolution-facto
108: vtk-write-saturation-ratios=false
109: vtk-write-saturations=true
110: vtk-write-temperature=true
111: vtk-write-total-mass-fractions=false
112: vtk-write-total-mole-fractions=false
113: vtk-write-viscosities=false
114: vtk-write-water-formation-volume-factor=false
End of OPM Flow Parameters
xdg-open /home/david/OPM/OPM Flow Documentation 2018-10 Rev-1 Reduced.pdf
  
```

OPM Flow Documentation 2018-10 Rev-1 Reduced.pdf — OPEN POROUS

File Edit View Go Bookmarks Help

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OPM OPEN POROUS MEDIA
FLOW DOCUMENTATION MANUAL (2018-10)
Revision: Rev-1

3 KEYWORD DOCUMENTATION STRUCTURE

The OPM Flow manual is constructed in a manner to enable the reader to reference various parts of the document by using the table contents, or by simply by pressing on a link embedded in the text. This automatic cross referencing has been extensively employed to ensure effective documentation of the keywords used by the simulator.

3.1 KEYWORD DEFINITIONS

Each keyword is defined in its own section that contains a section header, that contains the keyword name in capital letters followed by a brief description of the keyword's function. This is then followed by Keyword Table Section which defines the status of the keyword and which sections of the input deck the keyword can be utilized. Table 3.1 illustrates a typical Keyword Table Section defining the keyword status with the various OPM Flow sections.

RUNSPEC	GRID	EDIT	PROPS	REGIONS	SOLUTION	SUMMARY	SCHEDULE

Table 3.1: Example Keyword Table Section

The cells are colored in such a manner as to quickly indicate to the reader the keyword's section availability and function availability, with **green** colored cells indicating the keyword is available for this section and is mostly or fully implemented. Cells colored **gray** indicate that keyword cannot be used in that particular section, and cells colored **orange** show that cell is only partially implemented within OPM Flow, for example OPM Flow may simply just recognize the keyword and ignores the keyword's function, or only part of the keywords function is implemented. Finally, cells colored **red** means that keyword is available in the commercial simulator but has not been implemented in OPM Flow. In this scenario the keyword should not be used in OPM Flow as it will result in unpredictable results, including causing the simulator to abort or throw an exception.

3.2 MULTI-SECTION KEYWORDS

As there are numerous example the **ADD** and **DELETE** at the same time also keywords, the keyword Table Section as shown utilized.

RUNSPEC	GRID	EDIT	PROPS	REGIONS	SOLUTION	SUMMARY	SCHEDULE

Here the keyword can be by those cells colored **green**. A complete list of keywords is provided in the **KEYWORD INDEX - ALPHABETIC** and clicking on a keyword will take the reader to the keyword definition in a particular section.

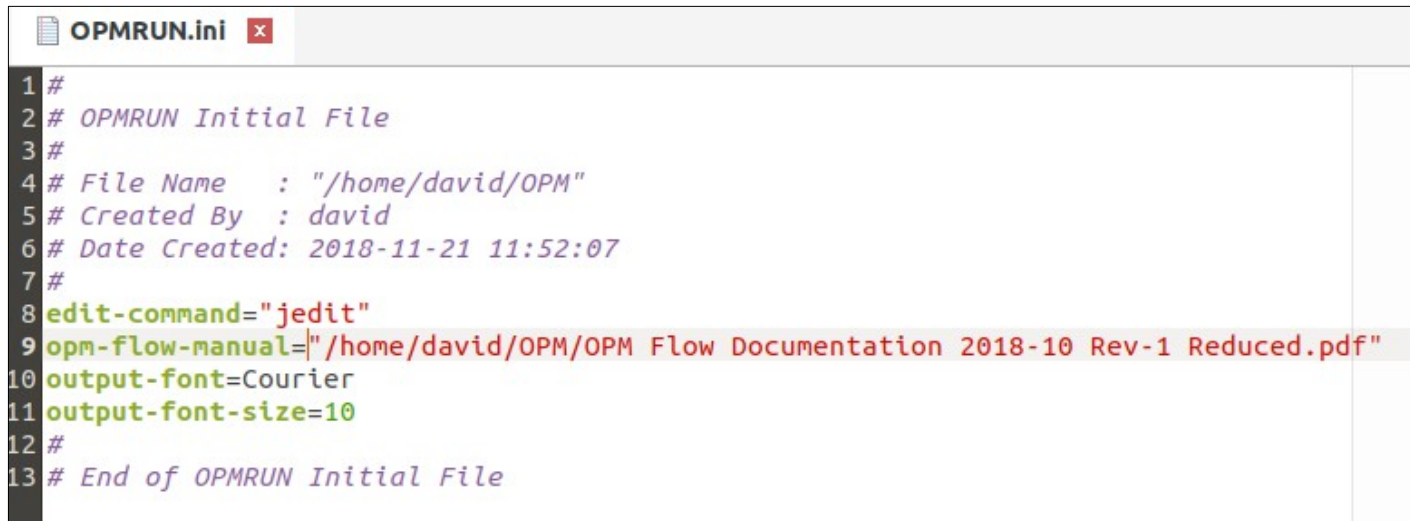
Navigation: Previous Page, Next Page, Reload, Autoscroll, Copy, Select All

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Run Jobs Kill Job Exit

EIPC OPMRUN: OPMRUN.INI Settings File

- Stored in user's home directory in sub directory OPM.
- Currently limited to:
 - Setting the editor,
 - Manual location, and
 - Flow output panels font and font size.



The screenshot shows a text editor window titled "OPMRUN.ini" with a red close button. The file contains 13 lines of text, with line numbers 1 through 13 on the left. The text is as follows:

```
1 #
2 # OPMRUN Initial File
3 #
4 # File Name   : "/home/david/OPM"
5 # Created By  : david
6 # Date Created: 2018-11-21 11:52:07
7 #
8 edit-command="jedit"
9 opm-flow-manual="/home/david/OPM/OPM Flow Documentation 2018-10 Rev-1 Reduced.pdf"
10 output-font=Courier
11 output-font-size=10
12 #
13 # End of OPMRUN Initial File
```

E I P C OPMRUN:What Is Next?

- Test and debug on various Linux versions. Note this is the first application by the author written using Python, so the code quality will be variable.
- Add more functionality:
 - Implement Kill Job option.
 - Add and edit OPMRUN properties dialog to edit the program's settings.
 - Add view results options to view the DBG, LOG, and PRT files.
 - Add job case compression option, to compress all a runs files into a single zip file for archiving.
 - Add real time plotting panel to see how the run is performing. May be need to have OPM Flow write out the field fluid rates and average pressure to the terminal.
 - Add progress bar showing the progress of each job, need the total number of days for the simulation.
- Once stable eventually aim to be part of the OPM Flow distribution as a binary file.

End of Presentation