

# MLE+ Instructions

Willy Bernal  
Commercial Buildings Group  
National Renewable Energy Laboratory  
willy.bernal@nrel.gov

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## 1 Introduction

MLE+ is an open-source Matlab/Simulink toolbox for building energy simulation, analysis, optimization and control design. At the core of MLE+ are co-simulation interfaces with multiple building energy simulation programs such as EnergyPlus and Radiance. MLE+ also provides easy-to-use graphical frontends and standard workflows for common tasks, for instance model identification and controller design. In addition, a BACnet interface is included which allows for a straightforward and transparent implementation of building controllers designed in Matlab/Simulink to real building systems. Figure 1 illustrates the overall structure of MLE+.

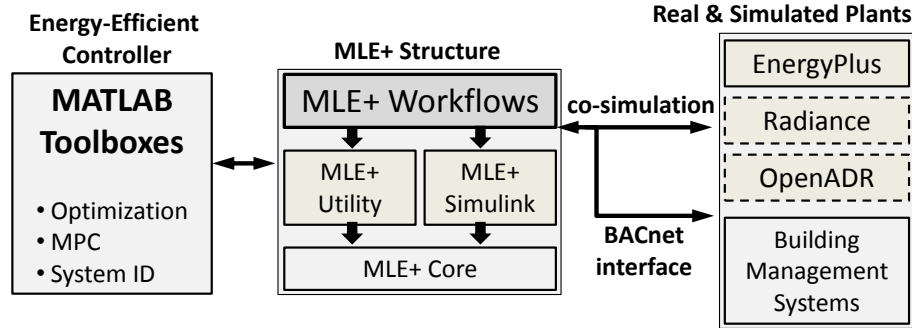


Figure 1: MLE+ interfaces control system toolboxes with building models and systems.

## 2 System Requirements

1. MLE+ requires Matlab and/or Simulink. It works in all recent versions of Matlab.

2. Java must be enabled in Matlab. Java socket library is used by MLE+ for communication with EnergyPlus.
3. EnergyPlus version 8.0.0. However, MLE+ should work well with previous versions of EnergyPlus.
4. BCVTB. MLE+ installation contains the required BCVTB files to run.

### 3 Installation Instructions

Once you have installed Matlab and E+ in your Windows Machine. Follow this instructions to setup MLE+ to work properly with your Matlab Distribution.

```

1  % This script sets up the environment for MLE+.
2  % It should be modified to the actual settings of the computer,
3  % including path to BCVTB, EnergyPlus, etc.
4  % Run this script once before using any MLE+ functions.
5  % Generally, this is only necessary on Windows machines. On
6  % Linux/MacOS, the default settings often work.
7  %
8  % (C) 2013 by Willy Bernal (willyg@seas.upenn.edu)
9
10 % Last update: 2013-06-24 by Willy Bernal
11
12 - global MLEPSETTINGS
13
14 - EplusDir = 'C:\EnergyPlusV8-0-0-mlep';
15 - JavaDir = 'C:\Program Files (x86)\Java\jre6\bin';

```

Figure 2: Simulink Example for a Small Office in E+

1. Download/copy/check out the files included in the repository folder `\Library\MLEP`
2. Modify the `mlepInit` file inside `\Library\MLEP` as shown in 3
  - Set the **EplusDir** variable to be the path to your E+ installation folder. Omit the `\` at the end of the string.
  - Set the **JavaDir** variable to be the path to your Java binary folder. (e.g. `C:\Program\jre6\bin`)
3. Run `mlepInit` from Matlab. Make sure your Matlab setup allows you to use the **addpath** and **savepath**.
4. Start using and testing the examples included in `\Demo\mlep - simple - demo`
5. Make sure you review the Dialog Parameters section to properly setup your E+ buildings.

## 4 Dialog Parameters

Certain Parameters need to be set for MLE+ to find all relevant files as well as communication parameters. Figure 4 shows a simple simulink example with a MLE+ block. If you click on the MLE+ block the Dialog Parameter Box will open ( 4). Here you have to set the following parameters:

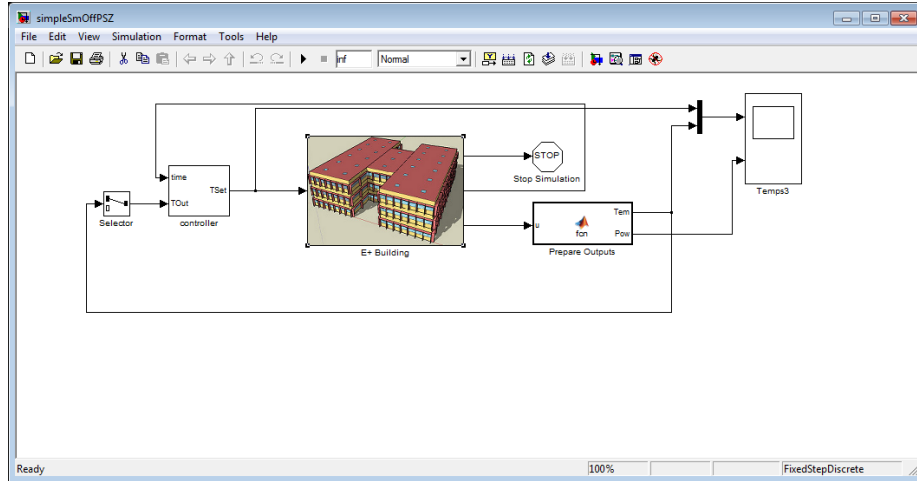


Figure 3: Simulink Example for a Small Office in E+

1. E+ Executable Path: This is the path to the RunPlus.bat files in your E+ installation folder.
2. IDF File: This is the folder where the IDF files resides.
3. Weather Profile: Only the name of the Weather Files. You can only select the weather files available in the Weather Data folder in your E+ installation.
4. Working Directory: This is the folder where the IDF file resides. The outputs of EnergyPlus will be dumped in this folder.
5. Timeout (in milliseconds): This is the timeout for the server to stop waiting for a client response. For bigger simulations, E+ takes longer to initialize, then this variable should be increased.
6. Socket Port: If set to 0, the server will be assigned any available port (Recommended).
7. BCVTB Directory: The BCVTB gets set when MLE+ is installed. MLE+ source files include a bcvtb folder. When this field is left blank MLE+

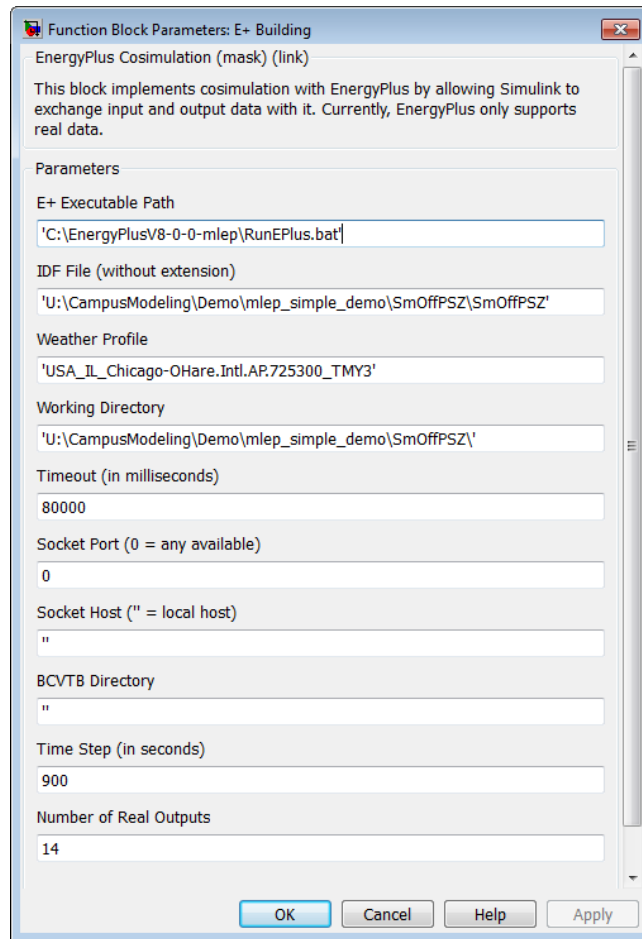


Figure 4: Simulink Example for a Small Office in E+

uses the files included in the MLE+ installation. The bcvtb folder contains necessary files that define the communication protocol between MLE+ and E+.

8. Time Step: This is the timestep for the MLE+ block execution. This determines the timestep at which the MLE+ block gets executed during the simulation. This allows you to run the MLE+ block at different time steps with respect to other Simulink Blocks.
9. Number of Real Outputs: This defines the number of Variables that the MLE+ block will output. Make sure this number agrees with your variables.cfg file (Configuration file with the number of inputs and outputs of the E+ model).