



# D-RM BUILDER INSTALLATION GUIDE

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## **1. INTRODUCTION**

D-RM Builder is a software toolkit for generating dynamic reduced models (D-RMs) from high-fidelity dynamic models or transient experimental data. Currently it supports high-fidelity dynamic models in Aspen Custom Modeler (ACM) form. The program was written in C++ for CPU intensive calculations and Python for Graphic User Interface (GUI) using PySide libraries. Although the code can be compiled on both Windows and Linux platform, it requires another CCSI package named SimSinter, which is also a Windows program. For those users who are not interested in further development, a Microsoft software installer “DRMBuilderSetup.msi” is provided for the current version that can be installed on Windows platform (Windows 7 or higher). To launch ACM simulations from D-RM Builder, the user also needs to install Aspen Tech’s ACM program.

## **2. PREREQUISITES**

### **2.1. Hardwad**

A computer run on Windows operating system

### **2.2. Software**

D-RM Builder is a software package to generate data-driven nonlinear dynamic models from high-fidelity ACM dynamic models or from experimental data of an existing plant. It has been tested on 32 bit and 64 bit Windows platforms. The current version is compiled in 32-bit system, which can be installed on both 32 bit and 64 bit Windows operating systems.

#### **2.2.1 Required third party software packages**

For developers who are interested in future revision and enhancement of the software package, Microsoft Visual Studio (version 2012 or higher) and Python 2.7 are needed.

For end users who are not interested in modifying the source code, no computer language packages are needed. The installer will install binary executables and required libraries, along with examples and documents.

Note: For both developers and end users, Aspen Tech’s ACM software package (Version 8.6 or higher) needs to be installed along with another CCSI’s tool named SimSinter, which is used to run ACM dynamic simulations.

## **3. BASIC INSTALLATION**

### **3.1. Third Party Software Installation**

#### **3.1.1 SimSinter Installation**

Please follow the instructions of SimSinter to install the CCSI package.

#### **3.1.2 Aspen Installation**

Please follow Aspen Tech’s installation guide to install ACM version 8.6 or higher.

### 3.2. Building Product (For Developers Only)

Developers need to install Python 2.7 and Microsoft Visual Studio (version 2012 or higher) on their Windows computer in order to compile and debug the program. Two Python packages including numpy and matplotlib also need to be installed.

There are two C++ projects in D-RM Builder, namely pyDRMSampling and pyDRMTraining. The two projects are compiled by Visual Studio to create two Python extension DLLs named “pyDRMSampling.pyd” and “pyDRMTraining.pyd” located in the “DLLs” folder. The two modules can be imported to Python code and called by passing a Python tuple as input parameter and returning a Python tuple as results.

To build two DLLs (pyd files), user needs to install Python 2.7 first since a header file “Python.h” and a library file “Python27.lib” are required the Visual Studio projects. The locations of those two files need to be configured inside the Visual Studio Window. Here are the steps to build “pyDRMSampling.pyd” file. The steps to build the “pyDRMTraining.pyd” are the same.

1. Open the visual studio solution file “pyDRMSampling.sln” and Microsoft Visual Studio GUI displays as shown in Figure 1. Note: The appearance

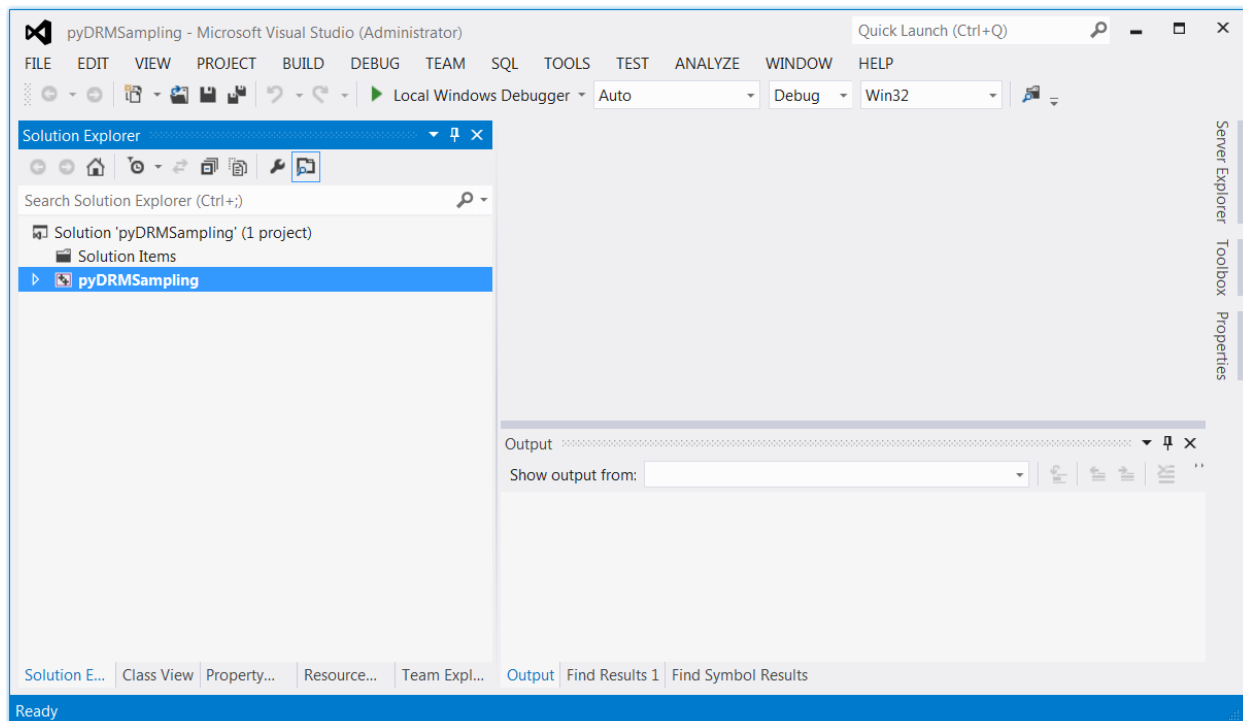


Figure 1. Visual Studio Window for pyDRMSampling Project

2. Click the dropdown box “Debug” and select “Release”. This allows Visual Studio to build a release version of the pyd file.

3. When “pyDRMSampling” in the “Solution Explorer” frame is selected, issue **Project**→**Properties** command to bring up a “pyDRMSampling Property Pages” dialog. In the left side frame, open the tree “Configuration Properties→C/C++→General” as shown in Figure 2

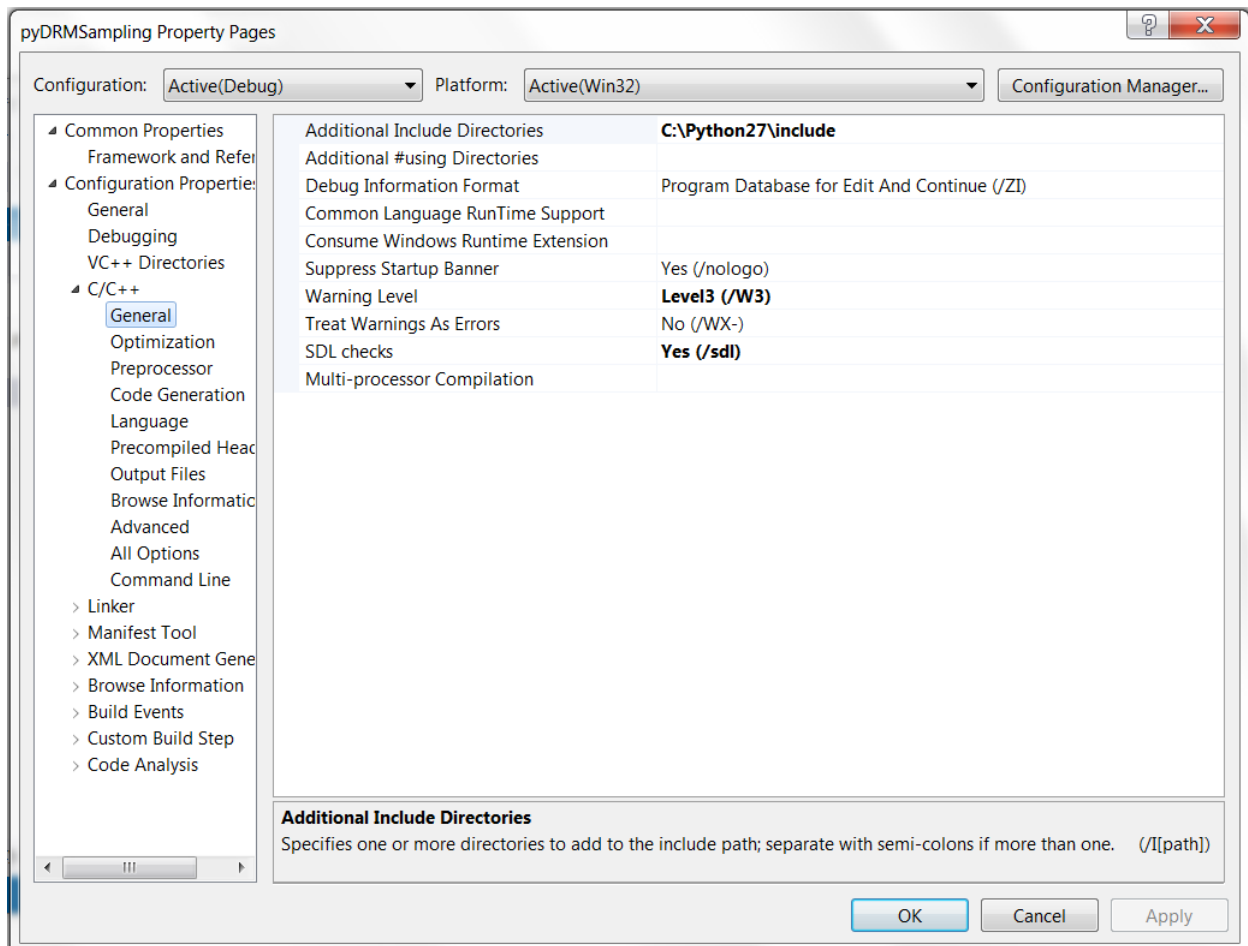


Figure 2. Project Property Configuration Dialog for Additional Include Directory

In the right frame, modify the entry for “Additional Include Directories” to the “include” directory of the Python 2.7 installed on the user’s computer. Figure 2 shows the default installed folder of “C:\Python27\include”. Next, open the tree “Configuration Properties→Linker→General” as shown in Figure 3. In the right frame, modify the entry for “Additional Library Directories” to the “libs” directory of the Python 2.7 installed on the user’s computer. Click “OK” to close the property page dialog.

4. In the main window of Visual Studio, issue **Build**→**Build Solution** command. The “pyDRMSampling.pyd” file will be created and written to the “DLLs” folder.

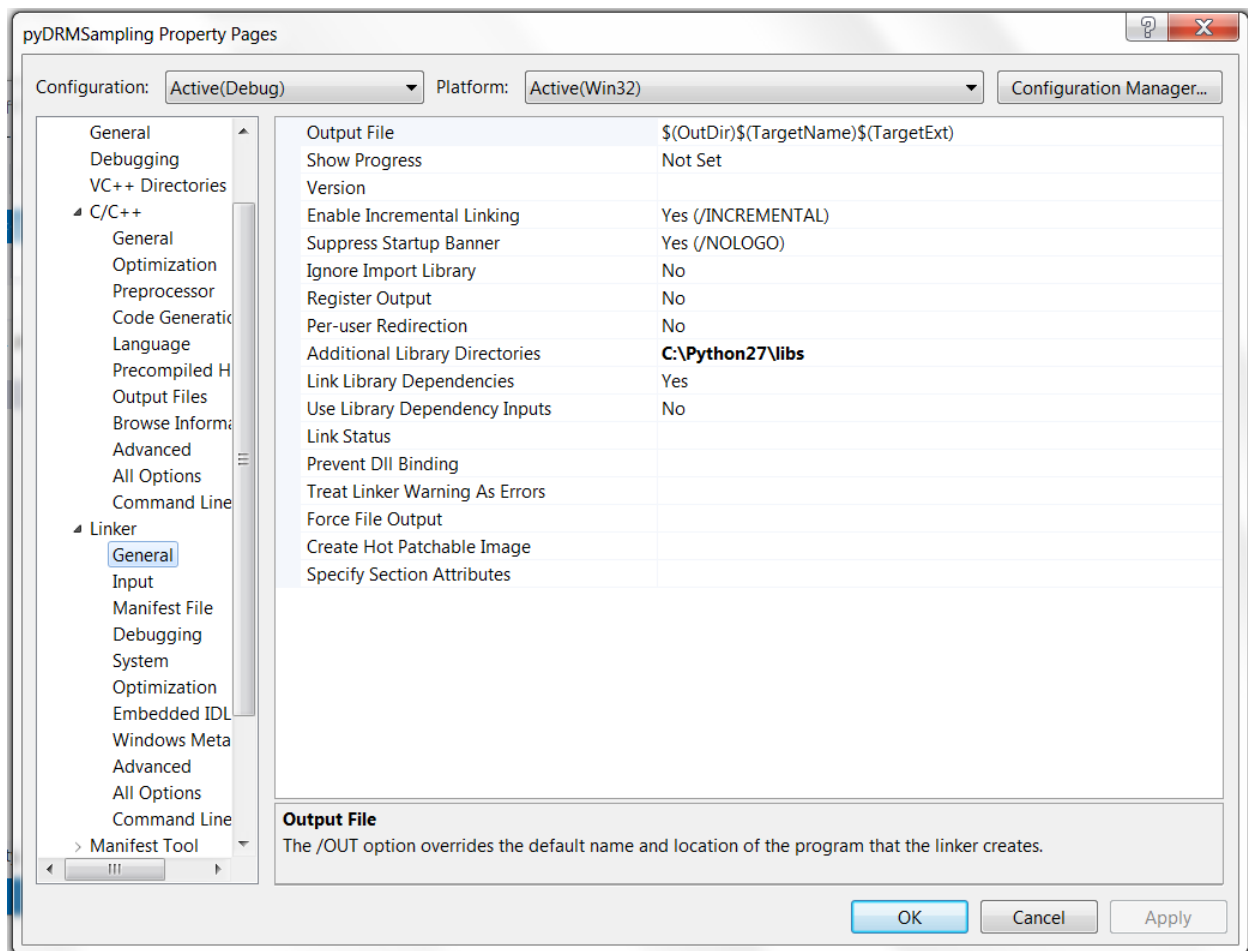


Figure 3. Project Property Configuration Dialog for Additional Library Directory

Please repeat Steps 1-4 to open the “pyDRMTraining.sln” and build the “pyDRMTraining.pyd” file.

Please also install SimSinter and ACM as described in Section 3.1.

The main program for D-RM Builder is written in Python using PySide libraries or GUI. “main\_drmbuiler.py” contains a main function which calls other Python code in the “gui” and “framework” directories. With Python 2.7 installed, the user can simply the following command in a DOS window to launch D-RM Builder:

```
python main_drmbuiler.py
```

The main window of D-RM Builder as shown in Figure 4 displays. This verifies that D-RM Builder is installed correctly for the developer. Note: Initial configuration process might be needed as described in Section 4.



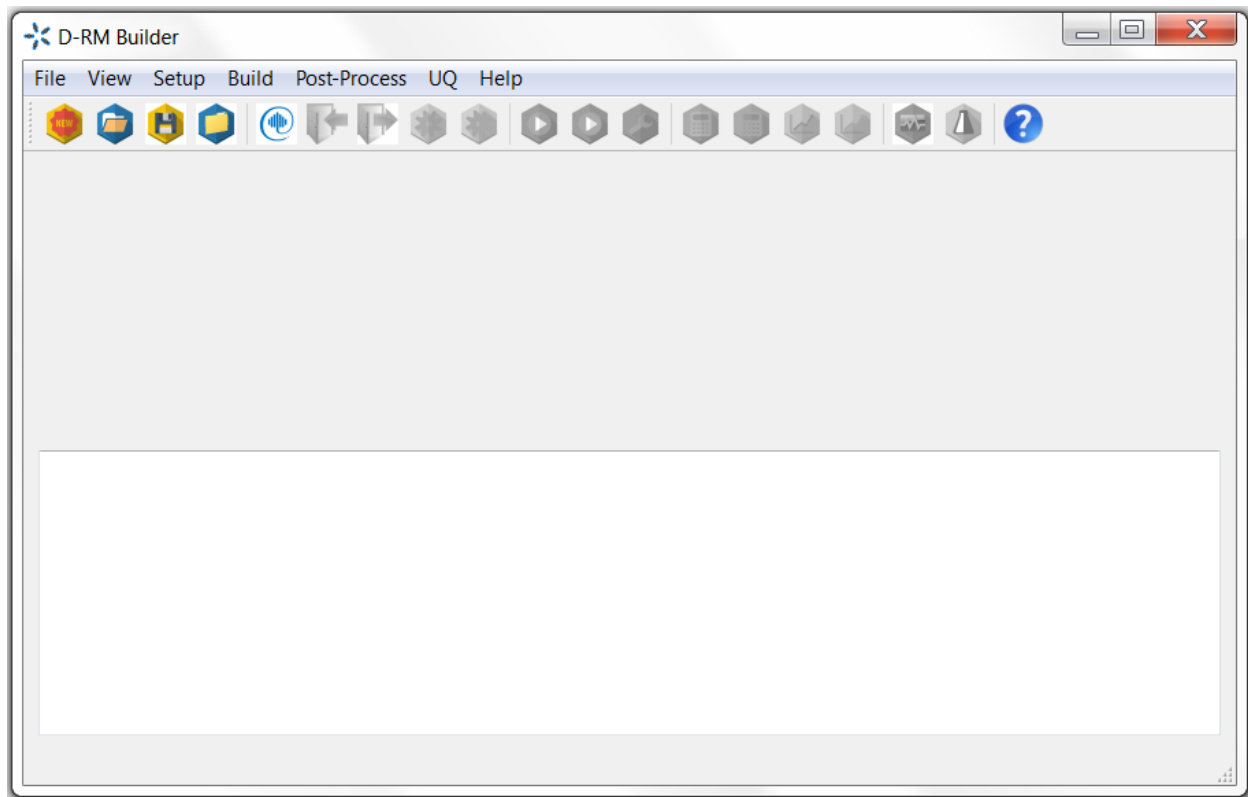


Figure 4. D-RM Builder Main Window

### 3.2.1 Build Distribution Package for D-RM Builder

A developer can use Python's py2exe utility to create the binary distribution files for end users. To create a distribution, run the following command in DOS prompt at the main source code directory:

```
python setup.py py2exe
```

It will create a folder named "build" and a folder named "dist". The files in the "dist" folder are the files that need to be installed on end user's computer. The executable program to launch D-RM Builder is "main\_drmbuilder.exe". It is strongly recommended that those files be wrapped in an installer with user's manual and examples in the "docs" and "examples" folders. The Microsoft installer file for the current version "DRMBuilderSetup.msi" is provided for this initial open source release.

### 3.3. Product Installation (for End Users)

For end users, simply run the provided Windows installer "DRMBuilderSetup.msi". Follow the instructions of the installer to complete the installation process. It is required that the user accept the license agreement displayed in one of the dialog window. The user also has the option to install the program in a user specified directory. The default directory is "C:\Program Files (x86)\CCSI\DRMBuilder". It also creates a shortcut on user's desktop and adds the D-RM Builder

program to Windows' "Start" menu. Note: An end user does not need to install Python 2.7 and other Python packages.

## **4. INSTALLATION TEST**

Simply click the shortcut on user's desktop or Window's start menu. When the D-RM Builder is run for the first time, it will create a configuration file "config.txt" in the "C:\ProgramData\CCIS\DRMBuilder" folder. The configuration file contains the full path of the SimSinter's installation directory. If SimSinter is installed in its default direction at "C:\Program Files (x86)\CCSI\SimSinter", the "config.txt" will be created automatically. Otherwise, the user needs to browse to SimSinter's installation directory. If SimSinter is not installed, the user needs to install it first and configure its path next time D-RM Builder is launched. D-RM Builder will exit if SimSinter is not installed. If both SimSinter and D-RM Builder are installed and configured correctly. The main window of D-RM Builder displays as shown in Figure 4. Once configured, D-RM Builder will not ask for the location of SimSinter when it is launched next time.

## **5. INSTALLATION PROBLEMS**

### **5.1. Known Issues/Fixes**

N/A

### **5.2. Reporting Installation issues**

Contact [ccsi-support@acceleratecarboncapture.org](mailto:ccsi-support@acceleratecarboncapture.org).

The email of lead development team for this product is [jinliang.ma@netl.doe.gov](mailto:jinliang.ma@netl.doe.gov),