

Simpack Tips : User Routine 操作方法

Simpack User Routine 有提供擴充的建模元件資料庫，部分特殊用途、相對較少使用到的建模功能不包含在預設的安裝包內，但使用者可在 Simpack 主使用者介面透過 Access Function 將元件增添至模型，或在分析中建立其他工程規範、運算處理等，Simpack User Routine 可以 Fortran 90 或 C 撰寫，Simpack 2017 與 2018 搭配 Compiler 版次如下表所示

	Windows	Linux
C Compiler and Linker	Microsoft® Visual Studio 2008 Standard SP 1 Microsoft® Visual Studio 2010 Professional SP 1 Microsoft® Visual Studio 2012 Professional Microsoft® Visual Studio 2013 Professional	gcc 4.3.3 through to 4.9.2
Fortran Compiler	Intel® Fortran Compiler 2010 SP1 (11.1) update-7 or newer 2010 updates (only together with Microsoft® Visual Studio 2008) Intel® Fortran Compiler 2011 SP1 (12.1) update-11 or newer 2011 updates (only with Microsoft® Visual Studio 2008 or 2010) Intel® Fortran Compiler 2013 SP1 (14.0) and all 2013 updates Intel® Fortran Compiler 2015 (15.0) and all 2015 updates	

表一，Simpack 2017 與 2018 搭配 Compiler 版次

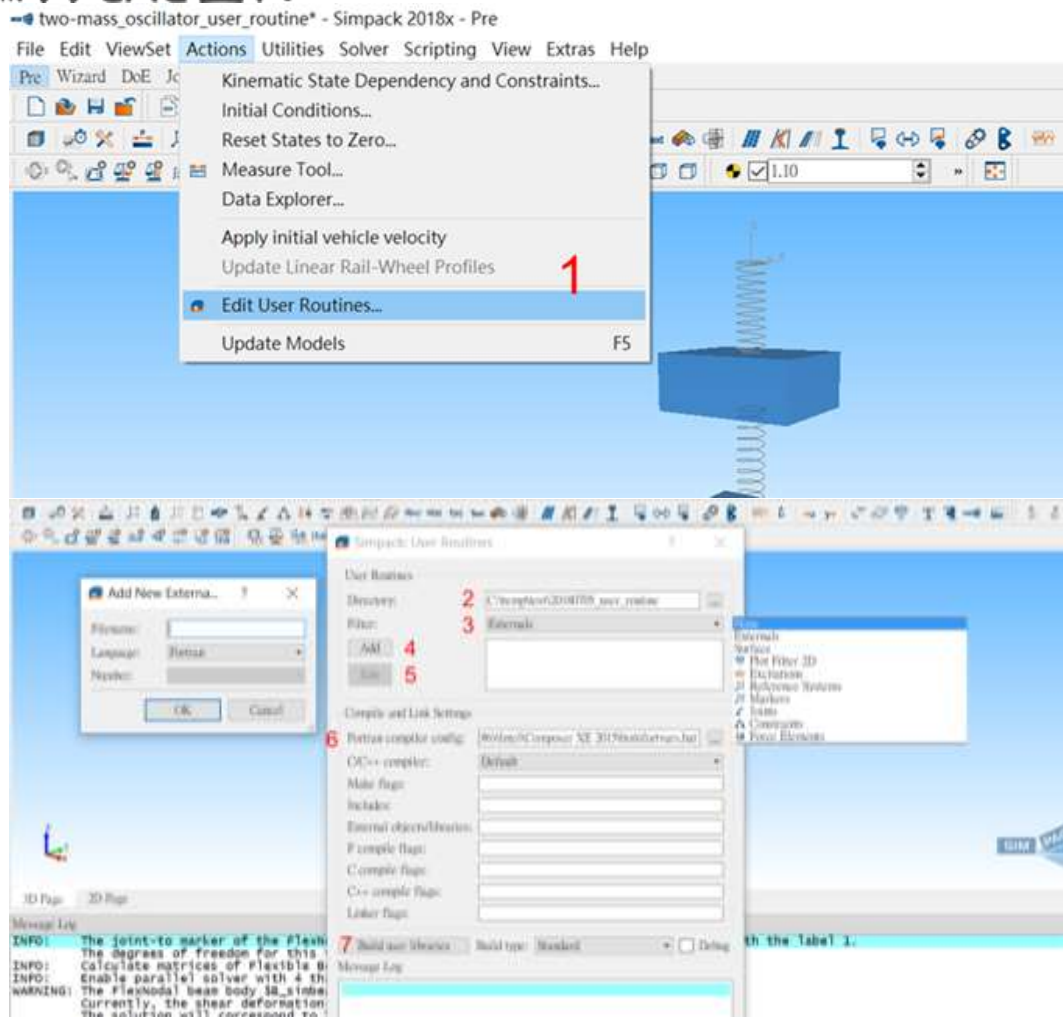
Access Function 非 Simpack 建模元件而是 Fortran subroutines，Access Function 提供軟體取得建模參數或輸出值等內部資料的路徑，依其目的可分為數個類別，以縮寫區別羅列如下：

- ▶ **Element access (AE):** Access to Modeling Element parameters and properties
- ▶ **Name access (AN):** Access to Modeling Element names
- ▶ **Scalar access (AS):** Access to intermediate results from Modeling Elements and to kinematic measurements that return a scalar
- ▶ **Vector access (AV):** Access to intermediate results from Modeling Elements and to kinematic measurements that return a vector
- ▶ **Define property (DF):** Definition (setting) of Modeling Element properties to be used in particular in the "setup" routines
- ▶ **Define scalar (DS):** Definition (setting) of states or similar scalar values that change during a simulation
- ▶ **Define vector (DV):** Definition (setting) of states or related values that change during a simulation by accessing a vector (or array) of them at once
- ▶ **Solver access (SLV):** Access to information and parameters of the currently used solver
- ▶ **Vector operations (V):** Vector operations, mostly for 3 by 1 vectors
- ▶ **Matrix operations (M):** Matrix operations, mostly for 3 by n or n by 3 matrices
- ▶ **Utility functions (UF):** Advanced mathematical functions, search path related functions and anything else that does not fit into the other groups
- ▶ **Get dimension (DIM):** Access to the number of Modeling Elements of a category that are defined in the model

內容撰寫規則、部分功能範例及常見問答皆記錄於 Simpack Documentation 中以提供使用者參考。

Simpack User Routine 的編輯位置於命令列 Actions>> Edit User Routine (1)，先選擇 User Routine 存放路徑(2)、目的(3)，並點選 Add 新增 Template (4)，Template 依照選定撰寫語言及種類編號（如有需要）產生，點選 Edit(5)編輯內容，再指認 Compiler 位置(6)，於 Build User Libraries(7)進行偵測、編譯並建立程序。功能鍵位置如圖一所示。

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圖一、使用者介面功能鍵位置

以定義一新 force element 為例，於 Filter 選擇 Force Elements、點擊 Add 後選定 Language 與 force element 編號，並於點擊 Edit 後依照 template 項目依序進行編輯：

1. Force element 的名稱"Spring-Damper in Z"

```
! name      '*123456789012345678901234567890*'  
type_name = 'Spring-Damper in Z'
```

2. Force element 的元件類別(i.e. Force Elements) 、輸入的參數、動態狀態與輸出值搭配的 Access Function

```
! Class  
call spck_df_FClass( fclass_force, ierr ) ! force element  
if ( ierr.ne. 0 ) goto 9001  
  
! static dimensions  
call spck_df_ForceParDim( 3, ierr ) ! parameters  
if ( ierr.ne. 0 ) goto 9002  
  
call spck_df_ForceStDynDim( 0, ierr ) ! dynamic states  
if ( ierr.ne. 0 ) goto 9002  
  
call spck_df_ForceOvDim( 3, ierr ) ! output values  
if ( ierr.ne. 0 ) goto 9002
```

3. 各項目的數量

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```
! Dimensions
npar = 3
nstdyn = 0
nov = 3
```

4. 各項目的名稱、類別、單位

```
! Parameters
! -----
!          name '123456789012345678901234567890'
par_name( 1) = 'Stiffness'
par_type( 1) = knr_double
par_unit( 1) = kp_stiffness

par_name( 2) = 'Damping'
par_type( 2) = knr_double
par_unit( 2) = kp_damping

par_name( 3) = 'Preload force'
par_type( 3) = knr_preload_slv
par_unit( 3) = kp_force
```

編輯並編譯後完成後，即可以在 Force Elements 的 library 看到新添的項目“Spring-Damper in Z”。