
# *ANSYS Workbench SwiftComp GUI*

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# ANSYS Workbench SwiftComp GUI - Overview

- **Name of the app: ANSYS Workbench SwiftComp GUI**
- **Target application: Mechanical and Design Modeler**
- **Description: It is a plugin to power ANSYS with efficient high-fidelity multiscale modeling for composites. It implements a true multiscale theory which assures the best models at a given level of efficiency to capture both anisotropy and heterogeneity of composites at the microscopic scale or any other scale of user's interest. It enables engineers to model composites as a black aluminum, capturing details as needed and affordable. This saves orders of magnitude in computing time and resources without sacrificing accuracy, while enabling engineers to tackle complex problems effectively.**

**The version of the App and the supported versions of ANSYS are the ones indicated on the App Store.**

# ACT App Store


- ***https://appstore.ansys.com/shop/ACTApps_act%20apps***
- **Great place to get started**
  - A library of helpful applications available to any ANSYS customer
  - New apps added regularly
  - Applications made available in either binary format (.wbex file) or binary plus scripted format (Python and XML files)
  - Scripted extensions are great examples
  - Documentation and training materials available on the ANSYS Customer Portal: https://support.ansys.com/AnsysCustomerPortal/en_us/Downloads/ACT+Resources

# Information



- **Please pay attention to paragraph 9 of the CLICKWRAP SOFTWARE LICENSE AGREEMENT FOR ACS EXTENSIONS regarding TECHNICAL ENHANCEMENTS AND CUSTOMER SUPPORT (TECS): “TECS is not included with the Program(s)”**

- **Report any issue or provide feedback related to this app please contact:**

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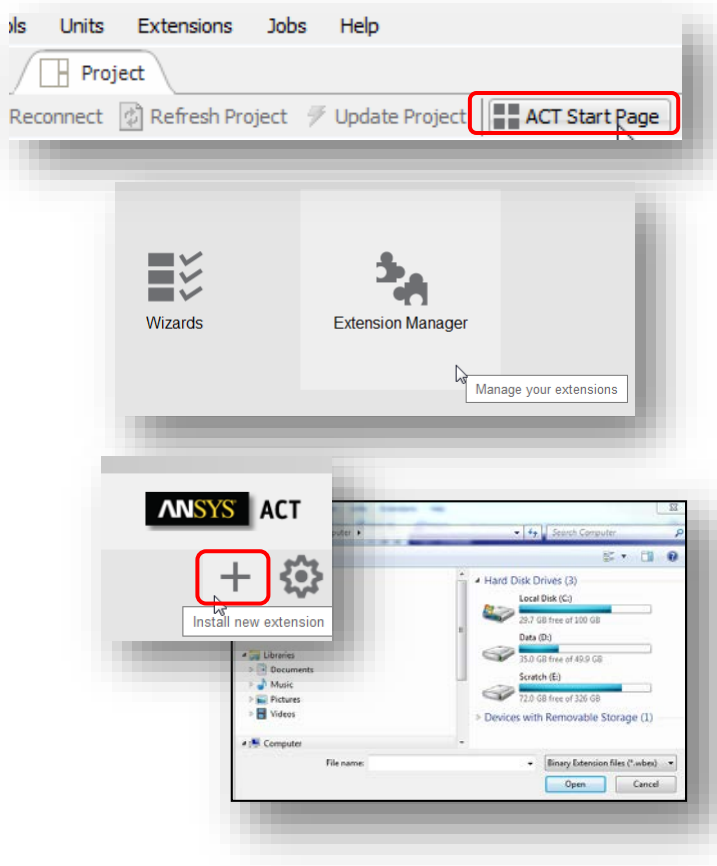
# Binary App Installation (1)

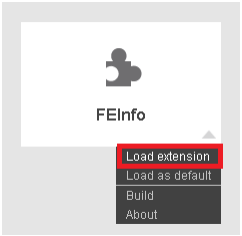
## Installing from the ACT Start Page:

1. From the project page, select the "*ACT Start Page*" option
2. Click on "Extension Manager"
3. Press "+" symbol in the top right corner
4. It will open a file dialog to select the appropriate "**.wbex*" binary file
5. The extension is installed




## Loading the extension:

1. From the Extension Manager, click on your extension and choose 'Load Extension'
2. The extension is loaded



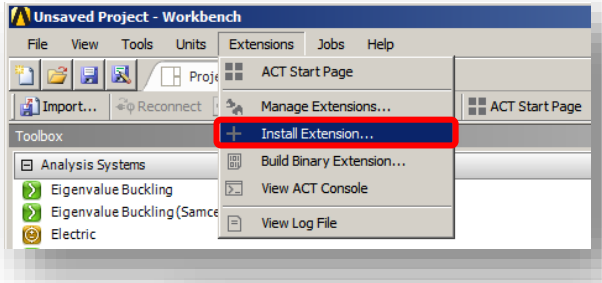

**Notes:**

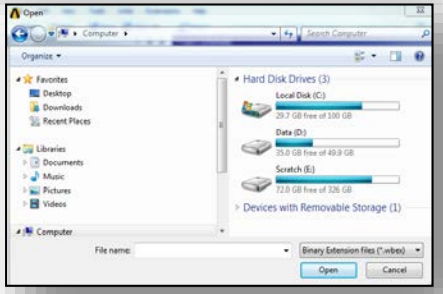
- The extension to be installed will be stored in the following location: %AppData%\Ansys\[version]\ACT\extensions
- The installation will create a folder in this location, in addition to the .wbex file
- Example for [version]: v180

# Binary App Installation (2)

## Installing from the Extensions menu:

1. From the Extensions menu, select the "*Install Extension…*" option
2. It will open a file dialog to select the appropriate "**.wbex*" binary file
3. Click "Open" to install the extension



## Loading the extension:

1. From the Extension Manager, click on your extension and choose 'Load Extension'
2. The extension is loaded

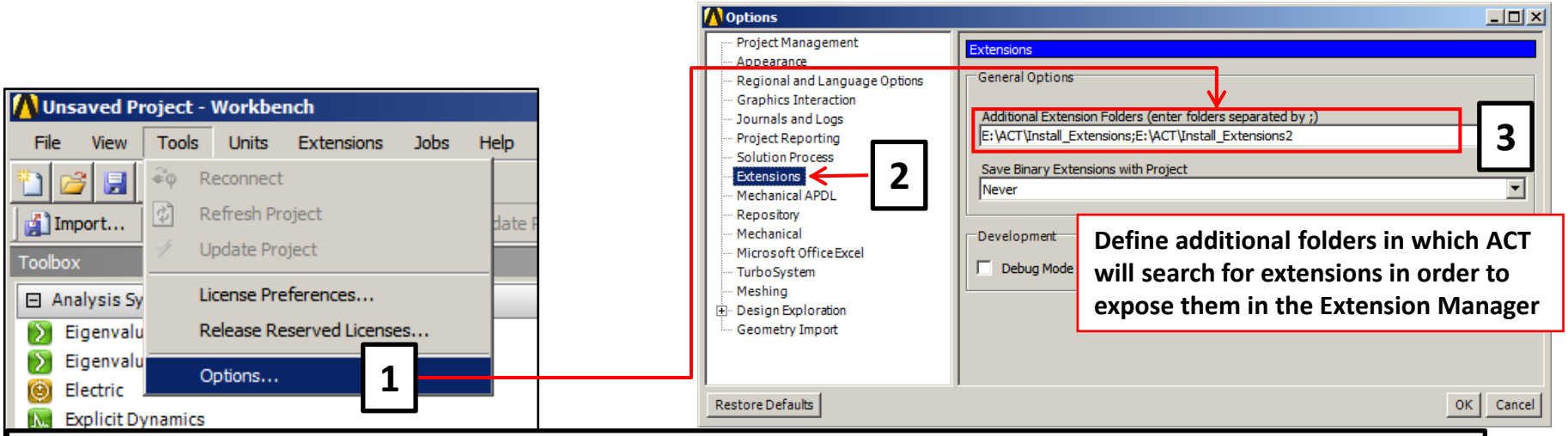
**Notes:**

- The extension to be installed will be stored in the following location: %AppData%\Ansys\[version]\ACT\extensions
- The installation will create a folder in this location, in addition to the .wbex file

# Binary App Installation (3)

- **Once the binary extension is installed at default location, one can move the *.wbex and the folder to any other location**
  - **Default path: *%AppData%\Ansys\[version]\ACT\extensions***
  - **New path: Any location on your machine, shared drive etc.**

- **All users interested in using the extension need to include that path in their Workbench Options**
  1. **In the *"Tools"* menu, select the *"Options…"***
  2. **Select *"Extensions"* in the pop up panel**
  3. **Add the path under *"Additional Extensions Folder …"***




**Notes:**

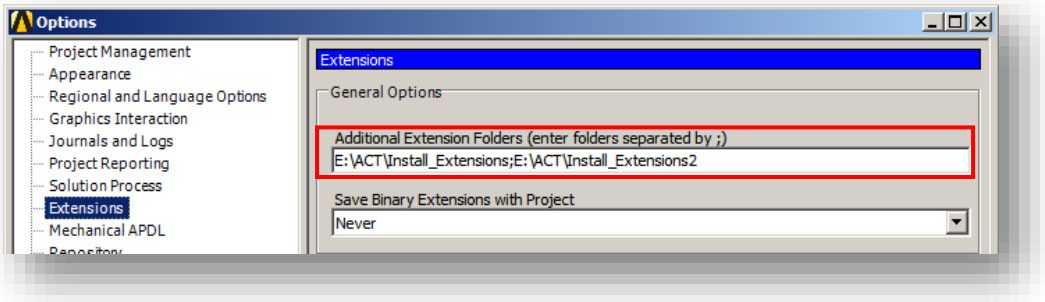
• During the scan of the available extensions, the folders will be analyzed according to the following order:

1. The application data folder(e.g. *%AppData%\Ansys\[version]\ACT\extensions)*
2. The additional folders defined in the "Additional Extension Folders" property
3. The installation folder
4. The "extensions" folder part of the current Workbench project (if the project was previously saved with the extension)

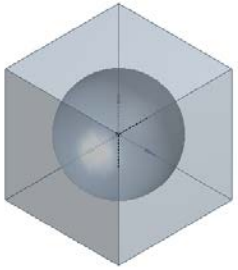
• If an extension is available in more than one of these locations, the 1st one according to the scan order is used

# Scripted App Installation (source code)

- **Paste the XML file and the corresponding folder on your computer. You can paste them either:**
  - **In the default path: *%AppData%\Ansys\[version]\ACT\extensions***
  - **In a user defined path: any location on your machine, shared drive etc.**
- **If the files are located in the default path, the extension is automatically available in the Extension Manager**
- **If the files are in a user defined path, it is required to define the "Additional Extension Folder" under Workbench menu (Tools → Options…) to make it available in the Extension Manager:**



# Multiscale Modeling Workflow for Beam Like Structure

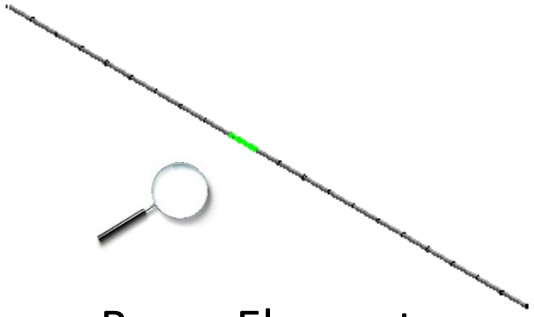


SwiftComp™

Homogenization

$$\begin{Bmatrix} F_1 \\ M_1 \\ M_2 \\ M_3 \end{Bmatrix} = \begin{bmatrix} S_{11} & S_{12} & S_{13} & S_{14} \\ S_{12} & S_{22} & S_{23} & S_{24} \\ S_{13} & S_{23} & S_{33} & S_{34} \\ S_{14} & S_{24} & S_{34} & S_{44} \end{bmatrix} \begin{Bmatrix} \gamma_{11} \\ \kappa_{11} \\ \kappa_{12} \\ \kappa_{13} \end{Bmatrix}$$

ANSYS®



Beam Elements

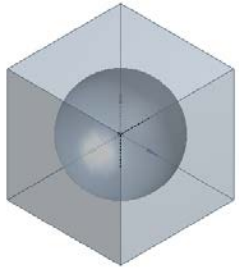
Structural Analysis

$\gamma_{11}, \kappa_{11}, \kappa_{12}, \kappa_{13}$

SwiftComp™

Dehomogenization

# Multiscale Modeling Workflow for Plate Like Structure

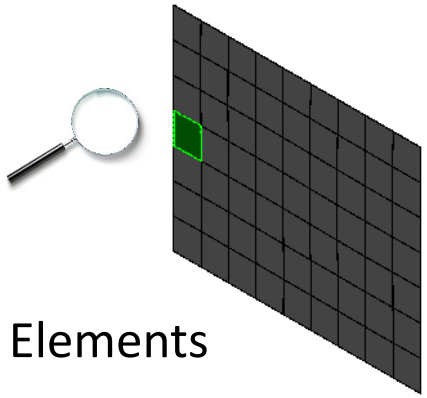


SwiftComp™

Homogenization

$$\begin{Bmatrix} N_{11} \\ N_{22} \\ N_{12} \\ M_{11} \\ M_{22} \\ M_{12} \end{Bmatrix} = \begin{bmatrix} A_{11} & A_{12} & A_{16} & B_{11} & B_{12} & B_{16} \\ A_{12} & A_{22} & A_{26} & B_{12} & B_{22} & B_{26} \\ A_{16} & A_{26} & A_{66} & B_{16} & B_{26} & B_{66} \\ B_{11} & B_{12} & B_{16} & D_{11} & D_{12} & D_{16} \\ B_{12} & B_{22} & B_{26} & D_{12} & D_{22} & D_{26} \\ B_{16} & B_{26} & B_{66} & D_{16} & D_{26} & D_{66} \end{bmatrix} \begin{Bmatrix} \epsilon_{11} \\ \epsilon_{22} \\ 2\epsilon_{12} \\ \kappa_{11} \\ \kappa_{22} \\ 2\kappa_{12} \end{Bmatrix}$$

ANSYS®



Shell Elements

ANSYS®

Structural Analysis

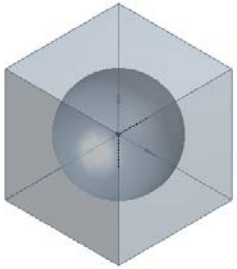
$\epsilon_{11}, \epsilon_{22}, 2\epsilon_{12}$

$\kappa_{11}, \kappa_{22}, 2\kappa_{12}$

SwiftComp™

Dehomogenization

# Multiscale Modeling Workflow for 3D Structure

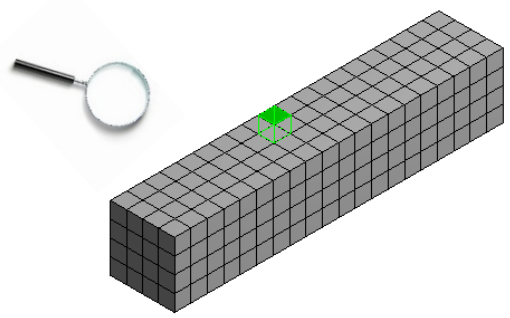


SwiftComp™

Homogenization

$$\begin{Bmatrix}\sigma_{11}\\ \sigma_{22}\\ \sigma_{33}\\ \sigma_{23}\\ \sigma_{13}\\ \sigma_{12}\end{Bmatrix} = \begin{bmatrix} c^*_{11} & c^*_{12} & c^*_{13} & c^*_{14} & c^*_{15} & c^*_{16}\\ c^*_{12} & c^*_{22} & c^*_{23} & c^*_{24} & c^*_{25} & c^*_{26}\\ c^*_{13} & c^*_{23} & c^*_{33} & c^*_{34} & c^*_{35} & c^*_{36}\\ c^*_{14} & c^*_{24} & c^*_{34} & c^*_{44} & c^*_{45} & c^*_{46}\\ c^*_{15} & c^*_{25} & c^*_{35} & c^*_{45} & c^*_{55} & c^*_{56}\\ c^*_{16} & c^*_{26} & c^*_{36} & c^*_{46} & c^*_{56} & c^*_{66}\end{bmatrix} \begin{Bmatrix}\varepsilon_{11}\\ \varepsilon_{22}\\ \varepsilon_{33}\\ 2\varepsilon_{23}\\ 2\varepsilon_{13}\\ 2\varepsilon_{12}\end{Bmatrix}$$

ANSYS®



Solid Elements

ANSYS®

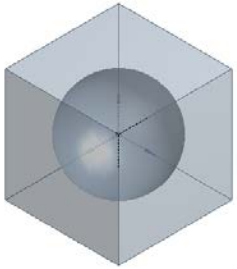
Structural Analysis

$$\varepsilon_{11}, \varepsilon_{22}, \varepsilon_{33}, 2\varepsilon_{23}, 2\varepsilon_{13}, 2\varepsilon_{12}$$

SwiftComp™

Dehomogenization

# Multiscale Modeling Workflow for Failure Analysis



SwiftComp™

Homogenization

$$\begin{Bmatrix} F_1 \\ M_1 \\ M_2 \\ M_3 \end{Bmatrix} = \begin{bmatrix} S_{11} & S_{12} & S_{13} & S_{14} \\ S_{12} & S_{22} & S_{23} & S_{24} \\ S_{13} & S_{23} & S_{33} & S_{34} \\ S_{14} & S_{24} & S_{34} & S_{44} \end{bmatrix} \begin{Bmatrix} \gamma_{11} \\ \kappa_{11} \\ \kappa_{12} \\ \kappa_{13} \end{Bmatrix}$$

or

$$\begin{Bmatrix} N_{11} \\ N_{22} \\ N_{12} \\ M_{11} \\ M_{22} \\ M_{12} \end{Bmatrix} = \begin{bmatrix} A_{11} & A_{12} & A_{16} & B_{11} & B_{12} & B_{16} \\ A_{12} & A_{22} & A_{26} & B_{12} & B_{22} & B_{26} \\ A_{16} & A_{26} & A_{66} & B_{16} & B_{26} & B_{66} \\ B_{11} & B_{12} & B_{16} & D_{11} & D_{12} & D_{16} \\ B_{12} & B_{22} & B_{26} & D_{12} & D_{22} & D_{26} \\ B_{16} & B_{26} & B_{66} & D_{16} & D_{26} & D_{66} \end{bmatrix} \begin{Bmatrix} \epsilon_{11} \\ \epsilon_{22} \\ 2\epsilon_{12} \\ \kappa_{11} \\ \kappa_{22} \\ 2\kappa_{12} \end{Bmatrix}$$

or

$$\begin{Bmatrix} \sigma_{11} \\ \sigma_{22} \\ \sigma_{33} \\ \sigma_{23} \\ \sigma_{13} \\ \sigma_{12} \end{Bmatrix} = \begin{bmatrix} c^*_{11} & c^*_{12} & c^*_{13} & c^*_{14} & c^*_{15} & c^*_{16} \\ c^*_{12} & c^*_{22} & c^*_{23} & c^*_{24} & c^*_{25} & c^*_{26} \\ c^*_{13} & c^*_{23} & c^*_{33} & c^*_{34} & c^*_{35} & c^*_{36} \\ c^*_{14} & c^*_{24} & c^*_{34} & c^*_{44} & c^*_{45} & c^*_{46} \\ c^*_{15} & c^*_{25} & c^*_{35} & c^*_{45} & c^*_{55} & c^*_{56} \\ c^*_{16} & c^*_{26} & c^*_{36} & c^*_{46} & c^*_{56} & c^*_{66} \end{bmatrix} \begin{Bmatrix} \varepsilon_{11} \\ \varepsilon_{22} \\ \varepsilon_{33} \\ 2\varepsilon_{23} \\ 2\varepsilon_{13} \\ 2\varepsilon_{12} \end{Bmatrix}$$

SwiftComp™

Failure Analysis

Failure Criterion
Failure Strength
...

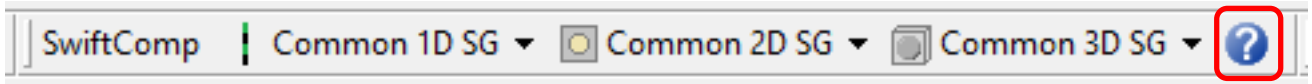
# References

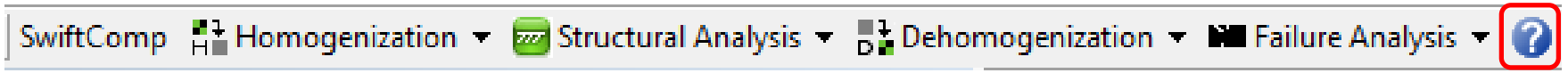
- **User Manual**

**For the details, please refer the user manual which is located at download package**

…\doc\User_Manual.pdf

**You can also open the same document from SwiftComp extension toolar as shown below figure.**




- **Reference Paper**

**1. Yu, W.: "A Unified Theory for Constitutive Modeling of Composites," Journal of Mechanics of Materials and Structures, vol. 11, no. 4, 2016, pp. 379-411.**

# Thank you

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