

The ANSYS logo is centered in the upper half of the slide. It consists of the word "ANSYS" in a bold, sans-serif font. The letters "AN" are white, and "SYS" are gold. A registered trademark symbol (®) is located at the top right of the "S". The logo is set against a solid black rectangular background.

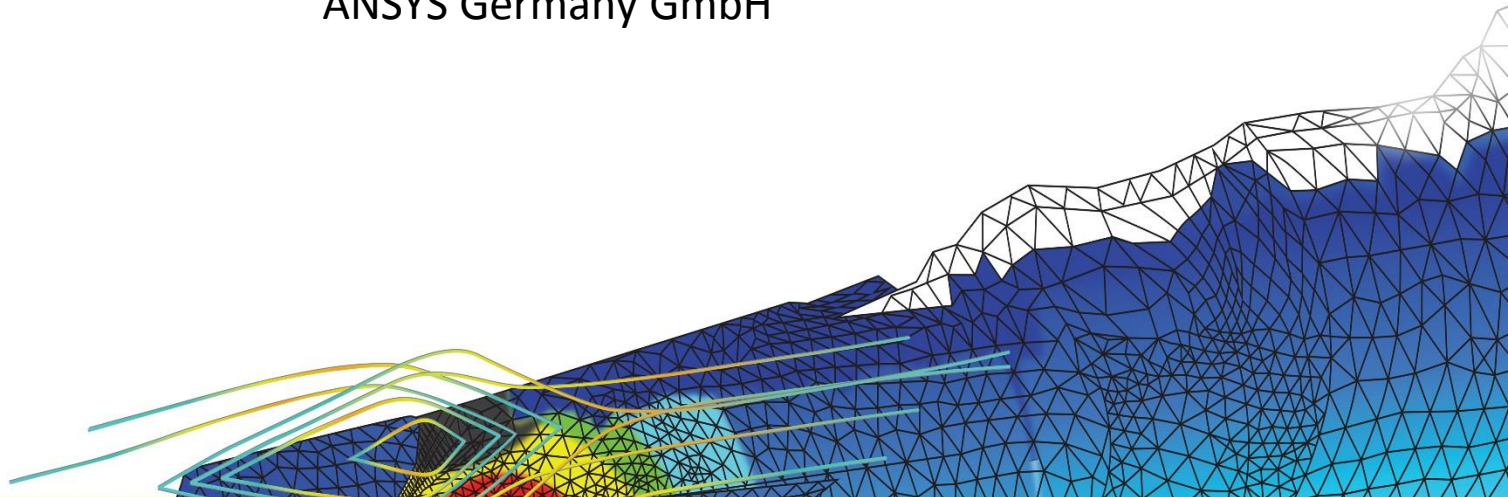
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ANSYS ACT (Application Customization Toolkit)

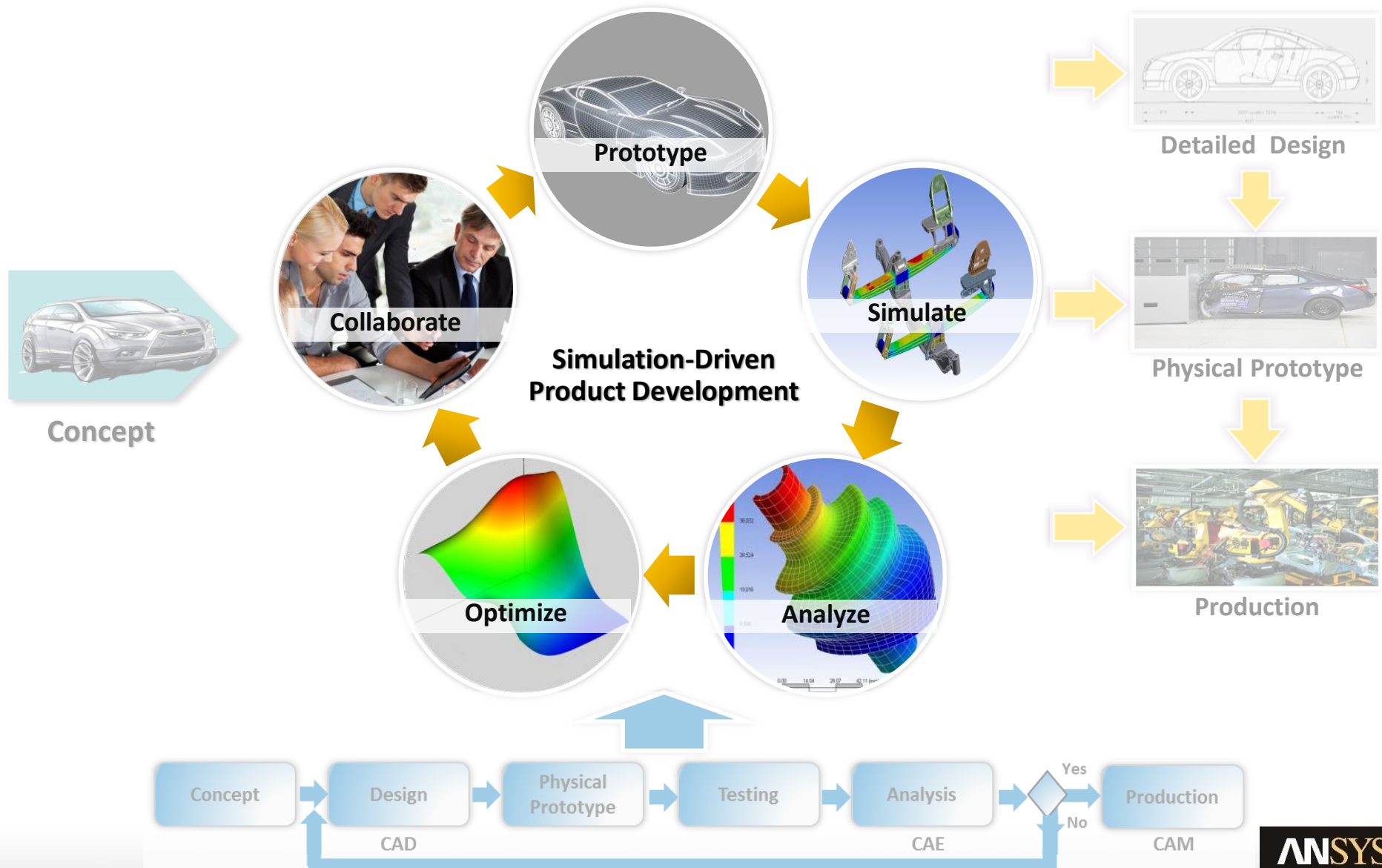
Einführung und anwendungsnahe Beispiele

Dr. Kerstin Wielage-Burchard

ANSYS Germany GmbH



Vision: Simulation Driven Product Development



Simulation Driven Product Design

The image illustrates a simulation-driven product design workflow. It features several key components:

- Start Design:** A yellow pipe with a red bend and a velocity field simulation labeled 'red'.
- Parameter Management:** A 'Parameters' panel on the left and an 'Outline of All Parameters' table on the right. The table lists parameters such as P1 (Length), P2 (Depth), P3 (Diameter), P5 (Edge Sizing Number of Divisions), P4 (Pipe_Length), P7 (pipe-inlet), P8 (pipe-temperature), and P13 (WB_Depth).
- Simulation Setup:** A 'FLUENT (C1)' window showing 'Setup' and 'Results' tabs.
- Optimization:** A 'Table of Design Points' table showing various parameter values for different design iterations. A 'Goal Driven Optimization' panel is also visible, listing options like 'Design of Experiments', 'Response Surface', and 'Optimization'.
- Optimized Design:** A grey pipe with a green bend and a velocity field simulation labeled 'green'.

All of this and much more... without any customization!

Why – Automation & Customization

- Increasing automation level
 - Time and expenses reduction
 - Minimize risks of errors
- Simple and easy way to connect with other third-part software tools in use:
 - Commonly used programs
 - In-house developed software
- Make the technology available to a wider group (non CAE experts)
- Integration of rules and guidelines
- Make sure that consistent processes exist in the company

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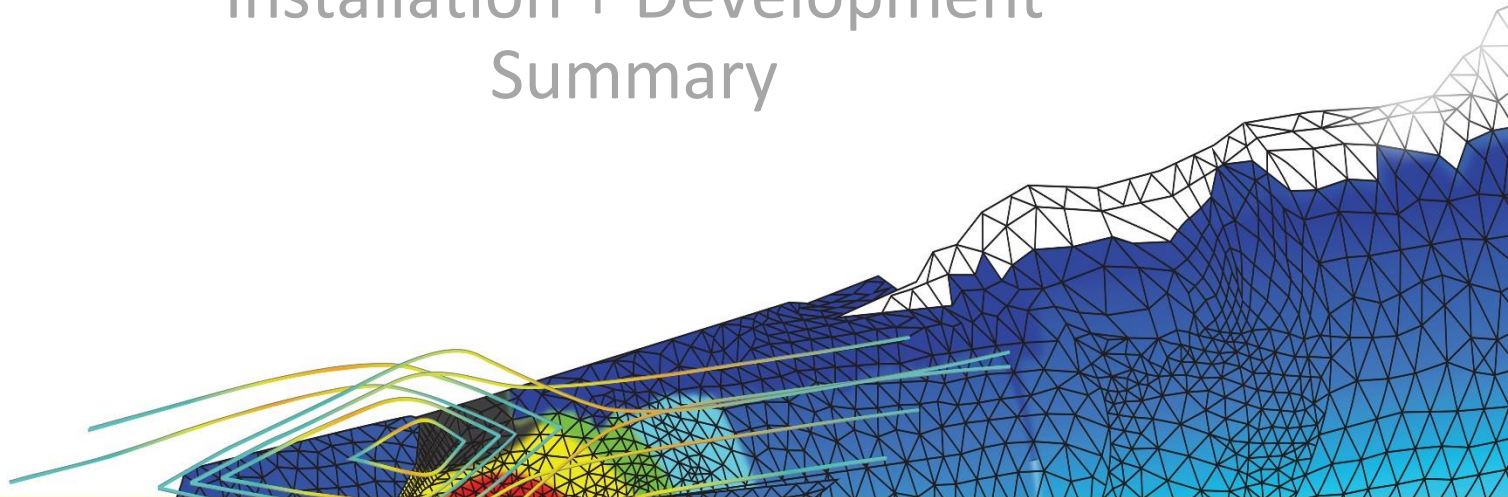
Application **C**ustomization **T**oolkit

Introduction

Examples

Installation + Development

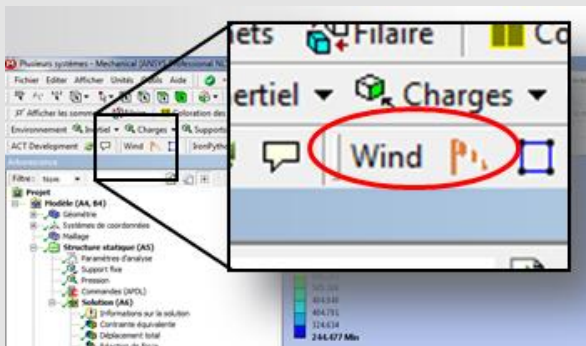
Summary



Application Customization Suite =

Application Customization Toolkit (ACT)

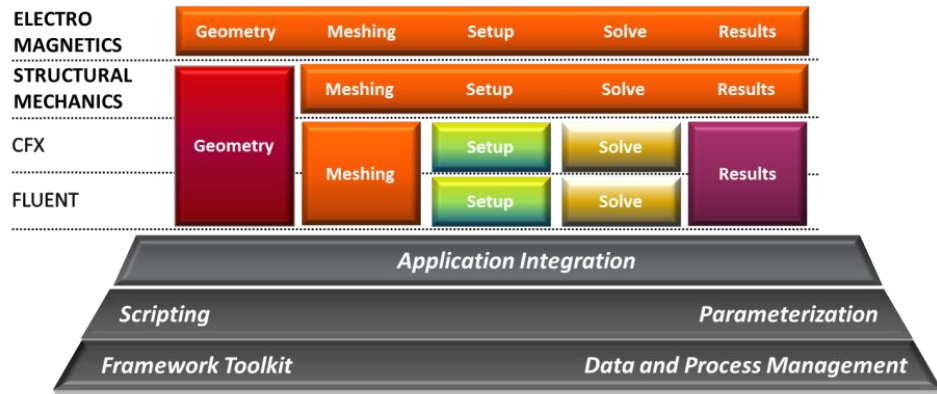
- Toolkit for application-level customization
- Specific to ANSYS Mechanical, DX, DM, Meshing, Wizards (within WB and standalone applications)
- ANSYS GUI
- Specialist programmer skills are NOT required



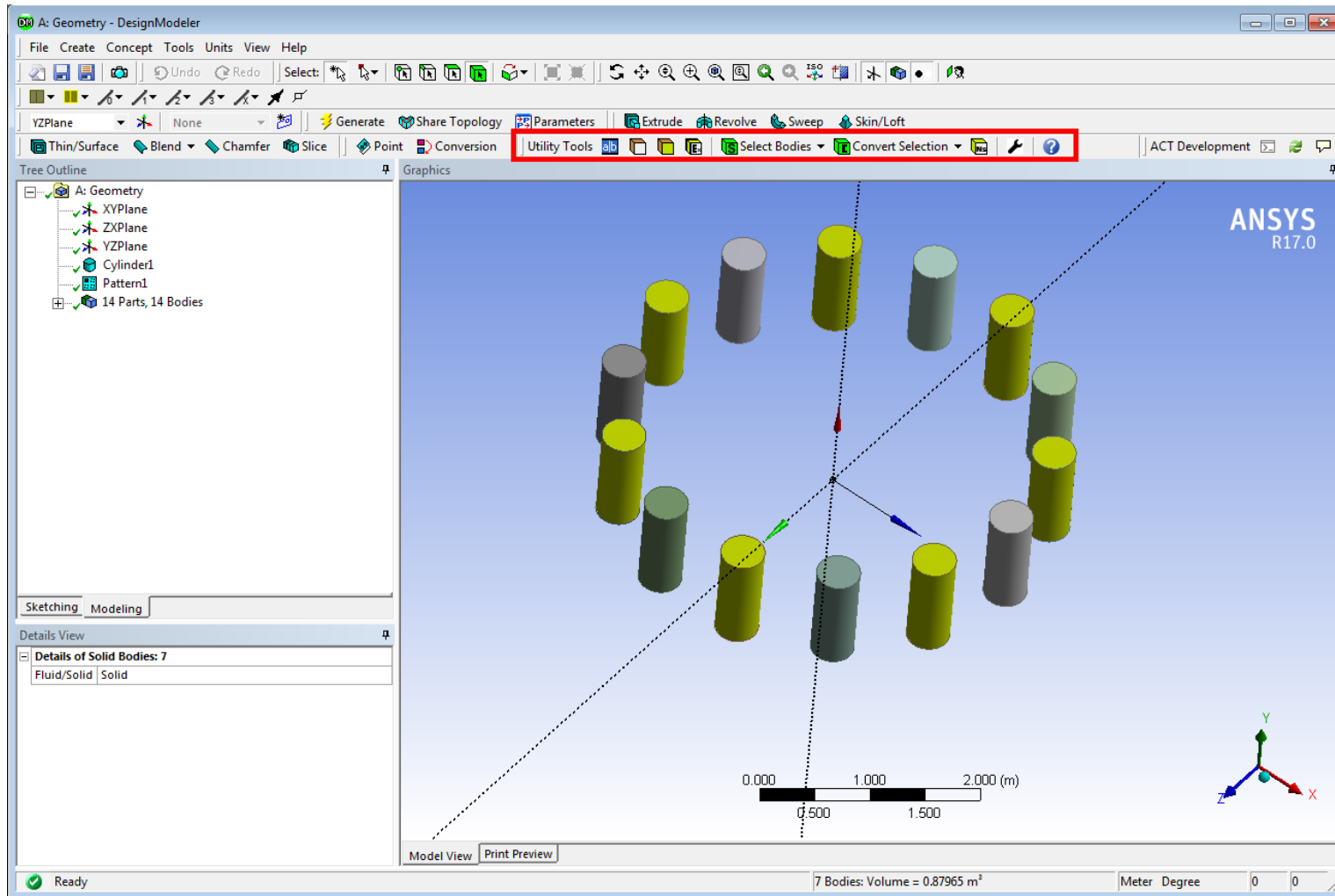
~~Workbench Software Development Kit (SDK)~~

- ~~Toolkit for Framework integration~~
- ~~System appears in the Toolbox on the WB project page~~
- ~~Third-party application GUI~~
- ~~Specialist programmer skills required~~

Your Application



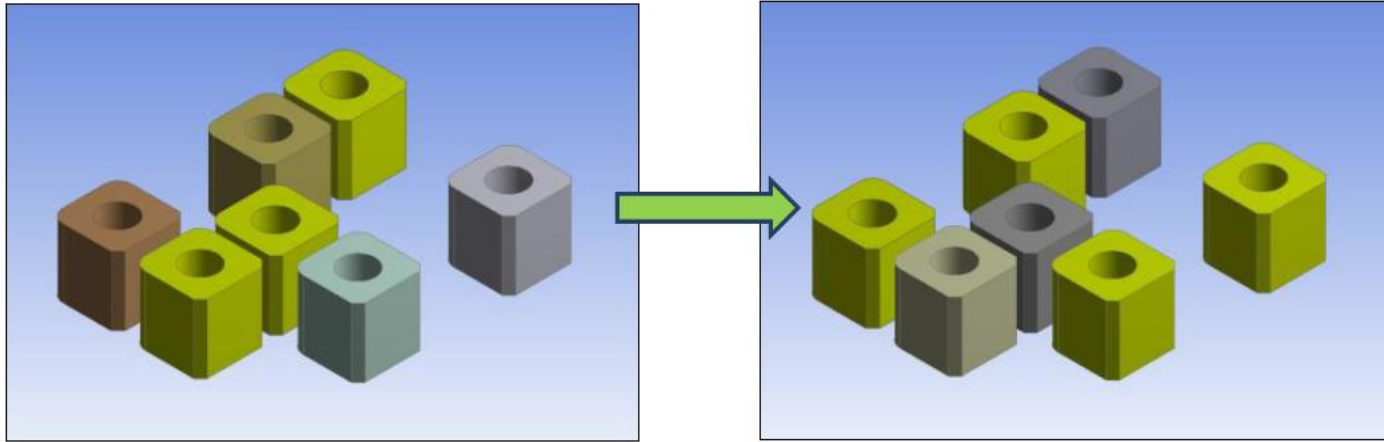
ACT – DesignModeler



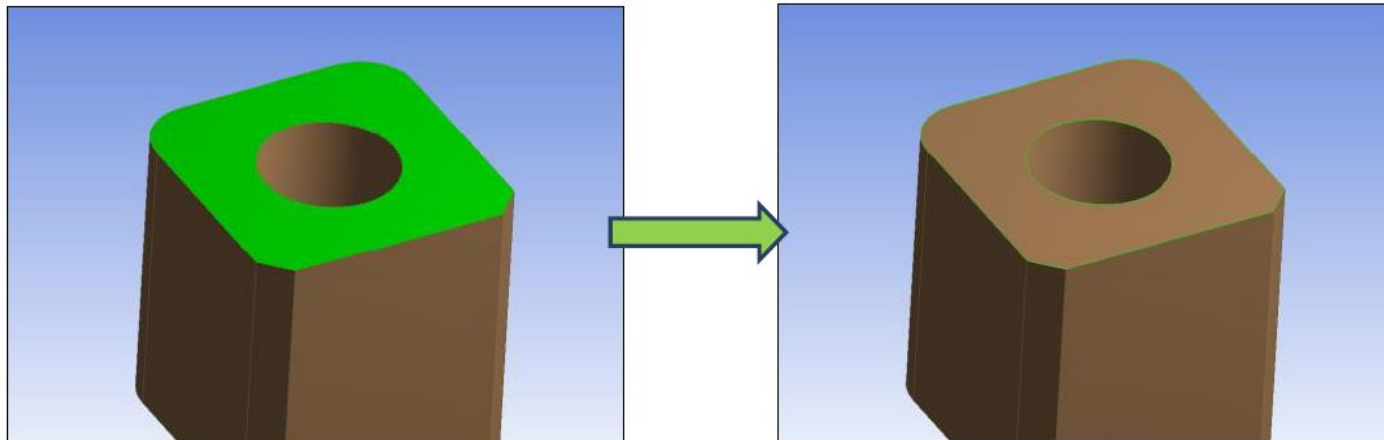
**Extra Toolbar
Buttons added
by ACT**

ACT – DM: Insert Customized Buttons

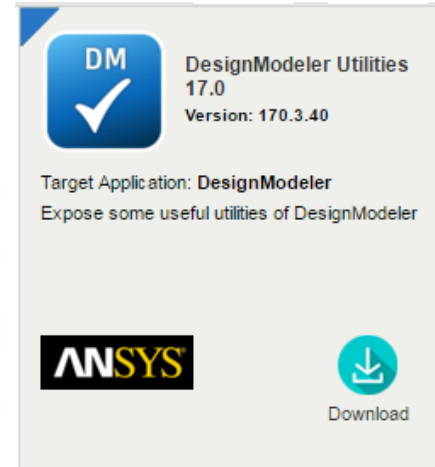
“Invert Selected Bodies” button : 



“Goto Lower Topology” button : 





Customer Portal:



DM
DesignModeler Utilities
17.0
Version: 170.3.40

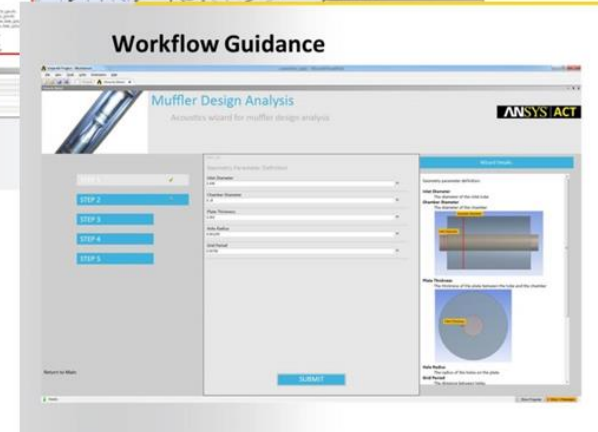
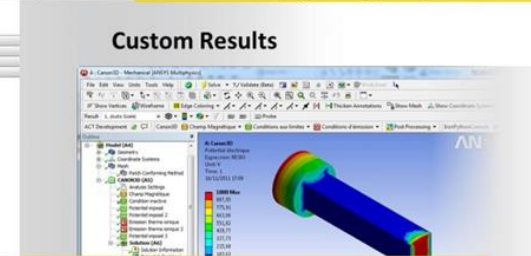
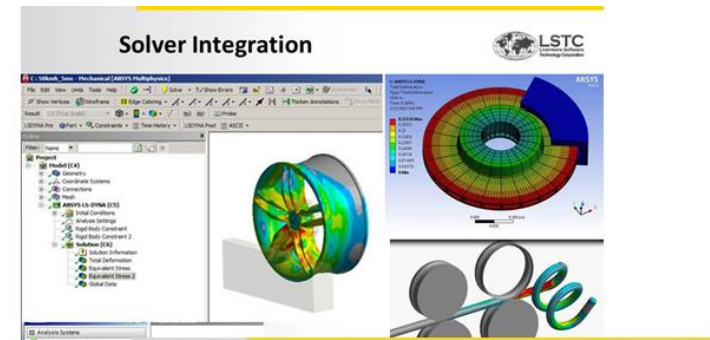
Target Application: DesignModeler
Expose some useful utilities of DesignModeler



Download

What is ACT?

- The ANSYS customization solution to develop **Apps** for customer-specific requirements.
- Integrate custom solvers
- Extend ANSYS products
- Automates simulation process
- Streamline fragmented workflow



From general purpose ... to customer specific

Apps deliver customer-specific solutions

- Manage workflow
- Capture expertise
- Add new features within Workbench
- Integrate in-house applications

Quickly deploy easy-to-use Apps within a unified environment

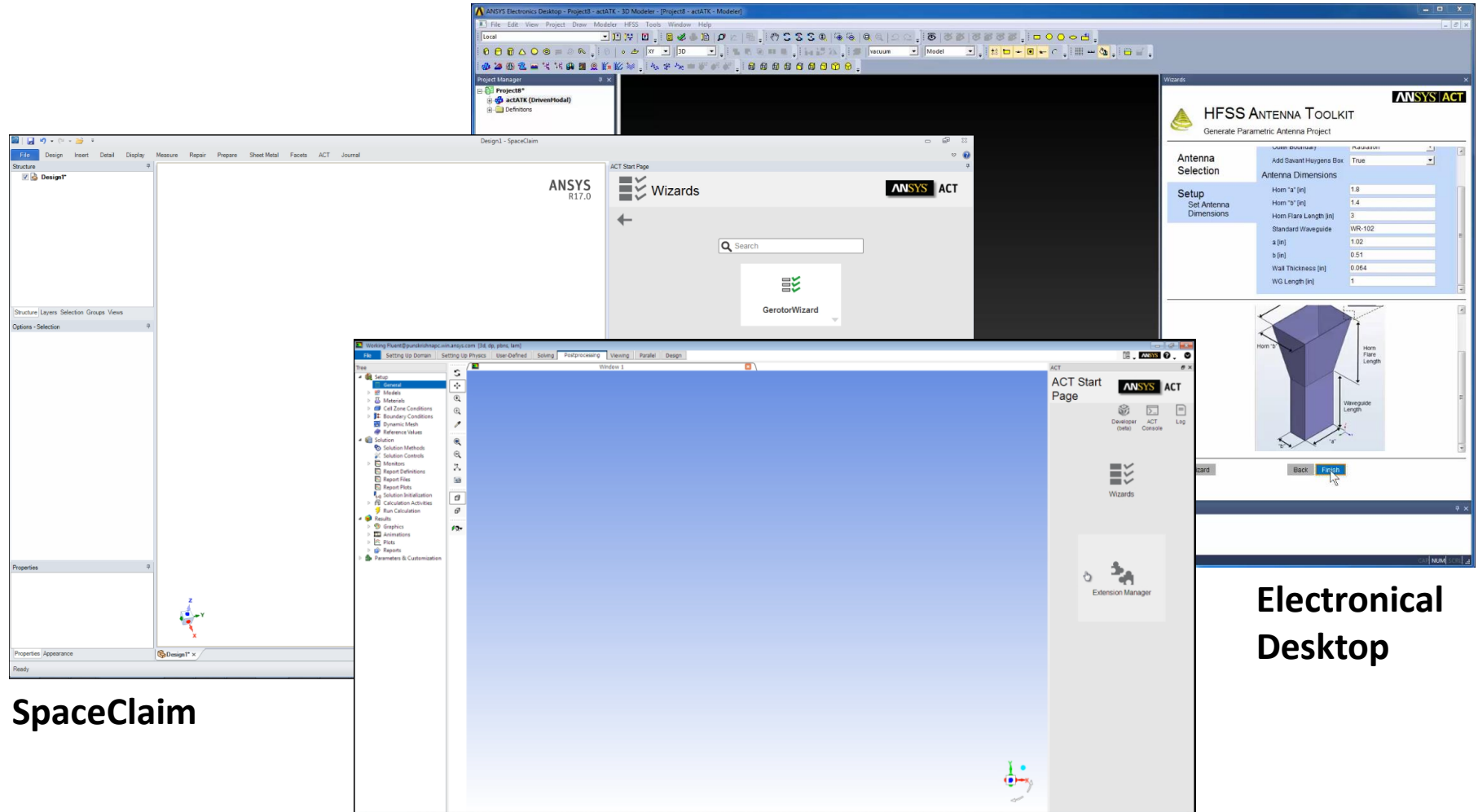
ACT-based Wizards

The screenshot shows the ANSYS ACT Project Wizard window. The title bar reads "Unsaved Project - Workbench". The menu bar includes "File", "View", "Tools", "Units", "Extensions", and "Help". The toolbar contains icons for "Project" and "Wizard". The main content area is titled "PROJECT WIZARD" and "ANSYS ACT". Below the title, it says "Simple wizard for demonstration in Project page." The interface is divided into several sections:

- General Info:** Indicated by an arrow pointing to the "PROJECT WIZARD" title and the "ANSYS ACT" logo.
- Steps:** A vertical list of steps: "Mechanical", "Fluent", "ReportView", and "CustomStep". An arrow points to this list.
- Data Entry:** A section titled "Basic properties" containing several input fields: "Geometry file name" (with a "Browse" button), "Integer value" (containing "1"), "Text value", "Quantity value" (with a unit of "MPa"), "Readonly value" (containing "My value"), "List of choice" (a dropdown menu with "Option1" selected), and "Option1 value". An arrow points to this section.
- Custom Help:** A section titled "Help" containing a tree view with a folder "A" and two sub-items "1 Geometry" and "2 Geometry". Below the tree view, it says "This step illustrates basic behaviors of a wizard and exposes a basic list of properties." An arrow points to this section.

At the bottom of the window, there are buttons for "Exit Wizard", "Back", and "Next". The status bar at the very bottom shows "Ready", "Show Progress", and "Show 0 Messages".

ACT-based wizards within applications





SpaceClaim

Fluent

Electronical Desktop

Fundamental capabilities of ACT



- Feature creation 
 - New and novel BCs, Loads, Results, ...
- Integration of third-party applications 
 - Embed your solver or tool into ANSYS Workbench
- Process Automation 
 - Defined workflows
 - ACT-based Wizards
 - At the schematic level or integrated within applications
 - Automate multiple applications at once
 - New automation API

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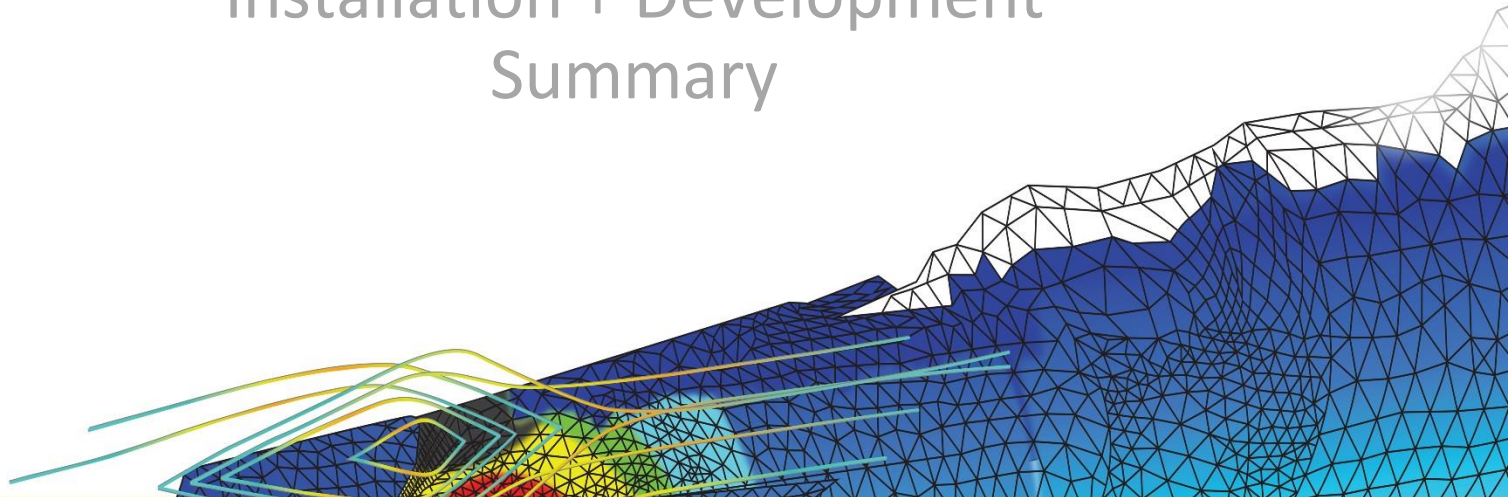
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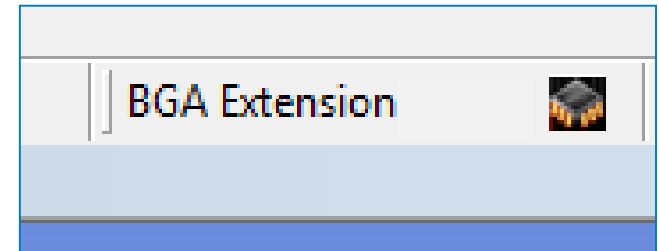
BGA-Geometry Creation ACT in DM

- BGA Packages are surface mounted packages for Integrated circuits
- Modeling BGA Package requires various inputs like no of balls, pitch, TSV info etc..
- Modeling BGA Package is tedious due to following reasons
 - Lot of variations in Input data
 - Input information is available in ASCILL format for vias, so manual creation is not feasible
 - Designers who understand only Electronics language and not familiar with CAD package cannot manage easily
- ACT extension is created to model BGA package with all desired inputs
- ACT extension reduces modeling time and increases productivity

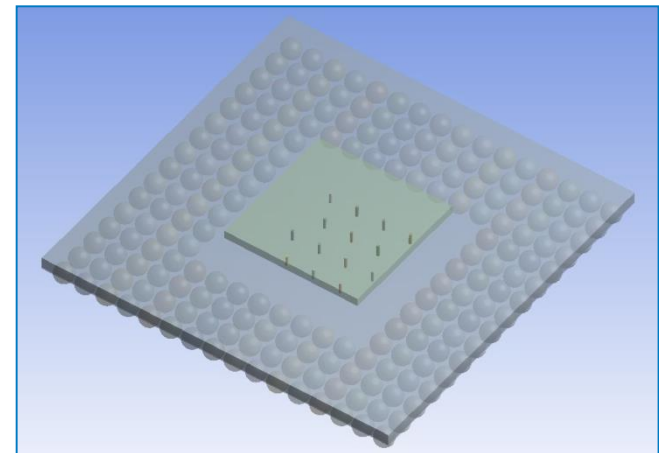
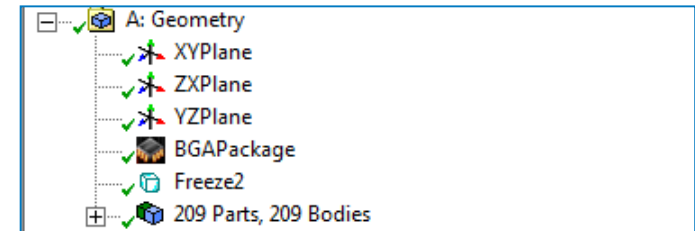


Different types of vias:

BGA Extension in DM

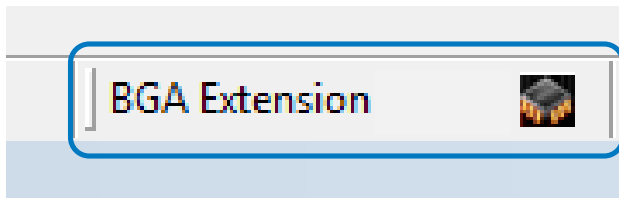


BGA Object in Tree view

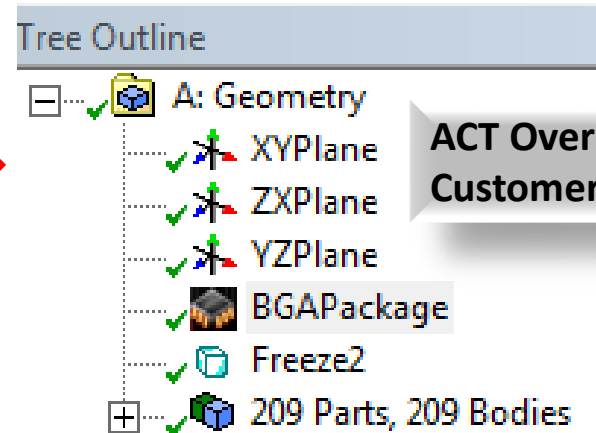


BGA Wizard Workflow in Workbench

Click BGA Extension in DM

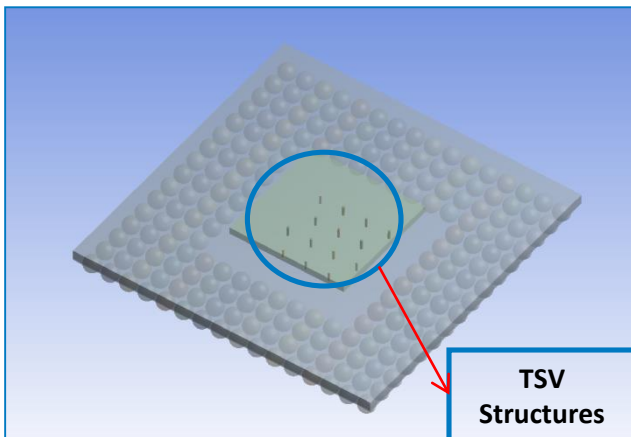


BGA Object Gets Created in Tree

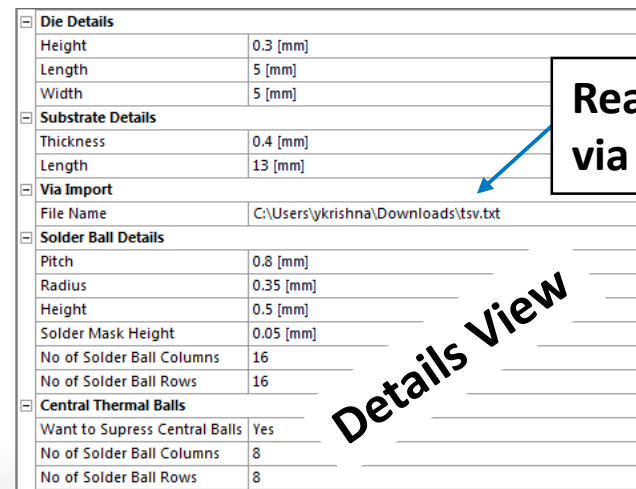


ACT Overview Video
Customer Portal

Generate Package



Fill Details View

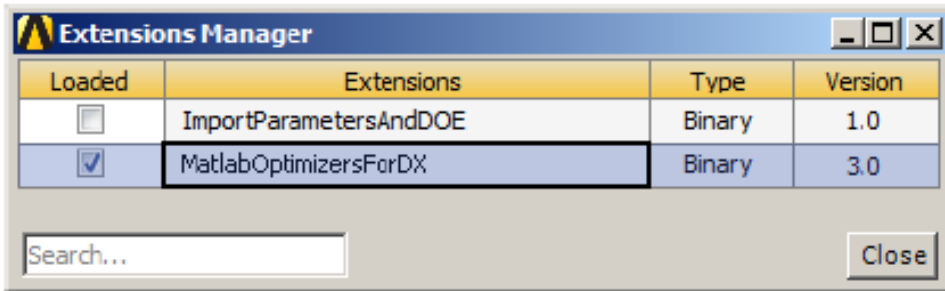


Die Details	
Height	0.3 [mm]
Length	5 [mm]
Width	5 [mm]
Substrate Details	
Thickness	0.4 [mm]
Length	13 [mm]
Via Import	
File Name	C:\Users\ykrishna\Downloads\tsv.txt
Solder Ball Details	
Pitch	0.8 [mm]
Radius	0.35 [mm]
Height	0.5 [mm]
Solder Mask Height	0.05 [mm]
No of Solder Ball Columns	16
No of Solder Ball Rows	16
Central Thermal Balls	
Want to Suppress Central Balls	Yes
No of Solder Ball Columns	8
No of Solder Ball Rows	8

Read file for
via import


Details View

MATLAB optimizers in DesignXplorer



Properties of Outline A2: Optimization

	A	B
1	Property	Value
2	[-] Design Points	
3	Preserve Design Points After DX Run	<input type="checkbox"/>
4	[-] Failed Design Points Management	
5	Number of Retries	0
6	[-] Optimization	
7	Method Name	Screening
8	Number of Samples	Screening
9	Maximum Number of Candidates	MOGA NLPQL MISQP
10	[-] Optimization Status	
11	Converged	Adaptive Multiple-Objective Adaptive Single-Objective
12	Number of Evaluations	generic optimizer (MATLAB)
13	Number of Failures	simulannealbnd (MATLAB Global Optimization toolbox)
14	Size of Generated Sample Set	gamultiobj - Genetic Algorithm (MATLAB Global Optimization toolbox) ga - Genetic Algorithm (MATLAB Global Optimization toolbox)
15	Number of Candidates	lsqnonlin (MATLAB Optimization toolbox) fminunc (MATLAB Optimization toolbox) fmincon (MATLAB Optimization toolbox)




MATLAB Optimizers for DX 17.0
Version: 170.3



Target Application: DesignXplorer

Expose MATLAB optimization algorithms and user programs in the Optimization component of ANSYS DesignXplorer
[\[Contains source code\]](#)





Download

Customer Portal

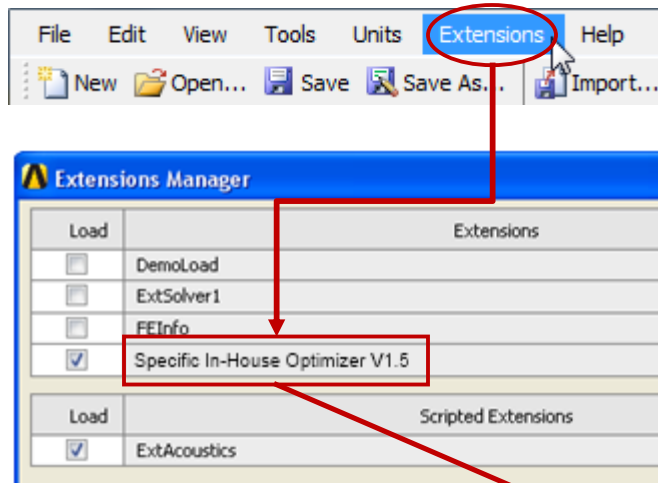



Using the MATLAB Optimizers Extension for DesignXplorer (17.0 Release)



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ACT for DesignXplorer



External Optimizer hosted in DX

Specific settings of the proprietary optimizers presented as for any other standard DX method

	A	B	C
1	Optimization Study		
2	Minimize P1; P1 >= 105	Goal, Minimize P1 (Default importance); Strict Constraint, P1 values greater than or	
3	Optimization Method		
4	Adaptive Single-Objective	The Adaptive Single-Objective method (LHS + Kriging + Nonlinear Programming by C global, optimization result. It supports a single objective, multiple constraints and an	
5	Configuration	Find 3 candidates in a maximum of 60 evaluations and 20 domain reductions.	
6	Status	Converged after 44 evaluations.	
7	Candidate Points		
8		Candidate Point 1	Candi
9	P2 - WB_X	0.52785	0
10	P3 - WB_Y	1.3022	
11	P1 - WB_Rosenbrock	★★ 105	★★

	A	B
1	Property	Value
2	Design Points	
4	Failed Design Points Management	
5	Number of Retries	0
6	Optimization	
7	Optimization Method	Adaptive Single-Objective
8	Number of LHS Initial Samples	Screening
9	Number of Screening Samples	MOGA
10	Number of Starting Points	NLPQL
11	Maximum Number of Evaluations	Adaptive Single-Objective
12	Maximum Number of Domain Reductions	Specific In-House Optimizer V1.5
13	Percentage of Domain Reductions	0.1
14	Maximum Number of Candidates	3
15	Optimization Status	
16	Converged	Yes
17	Number of Evaluations	44
18	Number of Domain Reductions	13
19	Number of Failures	0
20	Size of Generated Sample Set	44
21	Number of Candidates	3

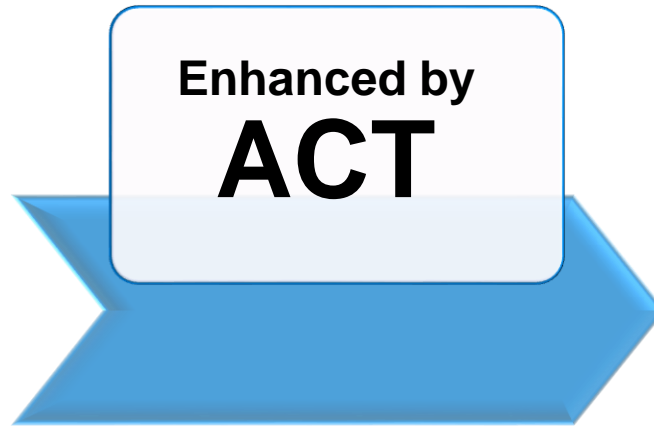
Proprietary/External optimizer accessible in DX, as an additional optimization method

Transient One-Way FSI

Imported Load (Solution 1)

- Solid Imported Body Temperature 2
- Solid Imported Body Temperature 3
- Solid Imported Body Temperature 4
- Solid Imported Body Temperature 5
- Solid Imported Body Temperature 6
- Solid Imported Body Temperature 7
- Solid Imported Body Temperature 8
- Solid Imported Body Temperature 9
- Solid Imported Body Temperature 10
- Solid Imported Body Temperature 11
- Solid Imported Body Temperature 12
- Solid Imported Body Temperature 13
- Solid Imported Body Temperature 14
- Solid Imported Body Temperature 15
- Solid Imported Body Temperature 16
- Solid Imported Body Temperature 17
- Solid Imported Body Temperature 18
- Solid Imported Body Temperature 19
- Solid Imported Body Temperature 20
- Solid Imported Body Temperature 21
- Solid Imported Body Temperature 22
- Solid Imported Body Temperature 23

Outline of Schematic A2 : External Data	
	A
1	External Data
2	Setup
3	D:\data\cfrey\Projects\ACT\Manifold\Transient\CSV_TRN_3D_NXYZ.sfe
4	D:\data\cfrey\Projects\ACT\Manifold\Transient\CSV_TRN_3D_TEMP.sfe
5	D:\data\cfrey\Projects\ACT\Manifold\Transient\CSV_TRN_3D_TIME.sfe
6	D:\data\cfrey\Projects\ACT\Manifold\Transient\Manifold_2D_NXYZ.sfe
7	D:\data\cfrey\Projects\ACT\Manifold\Transient\Manifold_2D_TIME.sfe
8	D:\data\cfrey\Projects\ACT\Manifold\Transient\Manifold_2D PRES.sfe
9	D:\data\cfrey\Projects\ACT\Test_FSI_Transient\FSI_Transient_test_old\CSV_TRN_3D32_TIME.sfe
10	D:\data\cfrey\Projects\ACT\Test_FSI_Transient\FSI_Transient_test_old\CSV_TRN_3D32_NXYZ.sfe



FSI

Transient (C5)

- Initial Conditions
- Analysis Settings
- Frictionless Support
- Frictionless Support 2
- Import Temperature
- Solution (C6)
- Solution Information
- Total Deformation
- Equivalent Stress
- Structural Error
- Imported Temperature
- Transient 2 (D5)

Time Step Control

Create Time Steps	Yes
-------------------	-----

- Clear GUI solution
- Highly automated
- Easy handling

Transient CHT Simulation



FSI Transient Load Mapping 17.0
Version: 170.3

Target Application: **Mechanical**

Map transient CFD results to thermal or structural analysis including the definition of load steps. Include CFD-post macros that also export transient data to csv files for use in External Data System for native transient data mapping

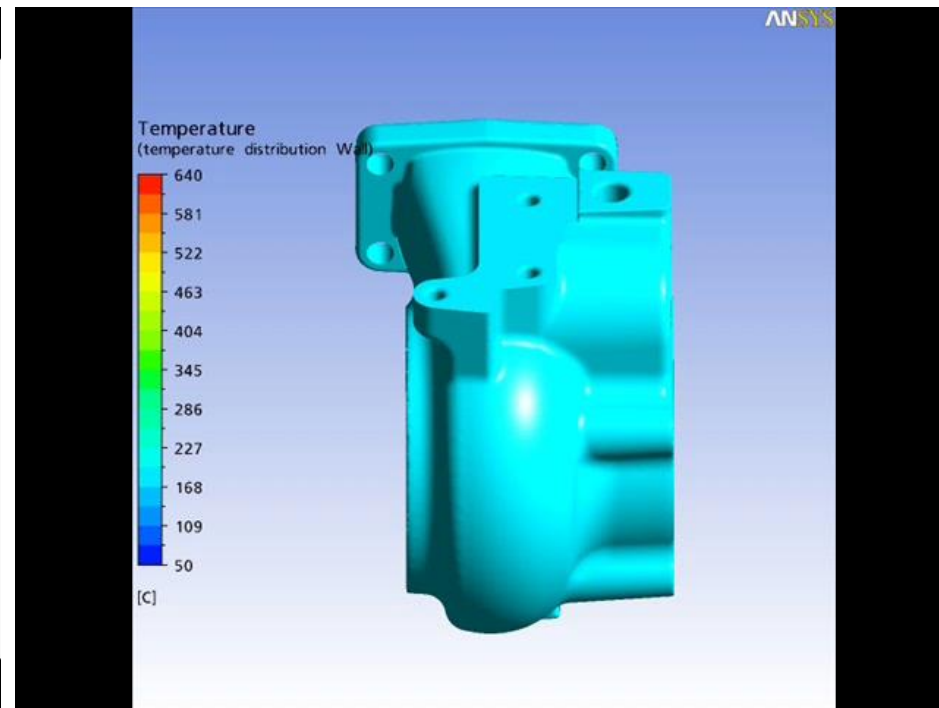


Download

Thermography, measured Data



Transient CHT Simulation



CHT = Conjugated Heat Transfer

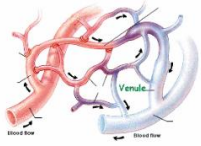
Fluent Wizard – Blood Vessels Flow Analysis

Fluent@punhsahrepc.win.ansys.com [3D_serial]

File Boundary Mesh Display Report Window 1

ACT Blood Vessels Flow Analysis ANSYS ACT

Mesh Import STL File: D:/users/Customization/ACT/ Browse
Geometry Type: Open
Analysis Maximum Element Size: 0.5 m
Minimum Element Size: 0.05 m
Results Extrusion for inlets/outlets: No
Show Advanced Settings: No

Help Import STL file and provide inputs like geometry type, min/max mesh sizes and growth rate. Then click 'Next' button to create mesh using above information.

Source: <https://humanphysiology2011.wikispaces.com/06.+Cardiology>

Exit Wizard Back Next

out1444383481 Fluent@punhsahrepc.win.ansys.com [3d_dp_pbrns.lam]

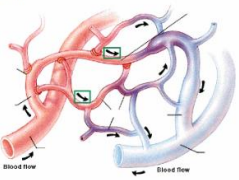
File Setting Up Domain Setting Up Physics User-Defined Solving Postprocessing Viewing Parallel Design Mesh

ACT Blood Vessels Flow Analysis ANSYS ACT


Mesh inlet-outlet-1
Boundary Type: Mass Flow Inlet
Mass Flow Rate: input required kg s⁻¹

Analysis inlet-outlet-2
Boundary Type: Mass Flow Inlet
Mass Flow Rate: input required kg s⁻¹

Results inlet-outlet-3
Boundary Type: Mass Flow Inlet
Mass Flow Rate: input required kg s⁻¹



Help 
Exit Wizard Back Next

Some more apps ...




Iterative Meshing 17.0
Version: 170.2.1

Target Application: **Meshing**
Allow to perform multiple trials in mesh generation and auto-select the best mesh from those





Download




CAD To Post 17.0
Version: 170.1

Target Application: **Project Schematic**
Allow Workbench users to easily import CAD into the CFDPost application





Download




Custom Update 17.0
Version: 170.2.2

Target Application: **Project Schematic**
Facilitate to automatically export various data during the "Update" process for a Component/System/Project and Design Point






Download




Acoustics 17.0
Version: 170.1

Target Application: **Mechanical**
Expose 3D acoustics solver capabilities






Video Download




Mixing Guided Process Template 17.0
Version: 170.1

Target Application: **Wizard**
Provide easy-to-use and automated workflow for creating mixing tank geometry, running single phase (flow blend and exposure analysis) simulations and generating comprehensive mixing report





Video Info



Honeycomb Creator 17.0
Version: 1.0

Target Application: **DesignModeler**
Easily create honeycomb core models from a few simple cell properties and bulk size specifications.
[Contains source code]



Download

Customer Portal: ANSYS ACT “Application Store”

ANSYS Customer Portal

Site Preferences | Sign Out

Search

About Search

Products Training & Support Consultancy Services Downloads Knowledge Resources Employees

From *FE Simulation* to *Knowledge-driven product development through simulation*

“WHEN ANSYS DEVELOPED ACT, IT WAS A GIANT STEP FOR INDUSTRIES. THIS AMAZING TOOL CAN BE AN INSTRUMENT FOR SHARING INTERNAL KNOW-HOW. FOR WEG, USING ACT RESULTED IN AN INSTANTANEOUS INCREASE OF KNOWLEDGE.”

Cassiano A Cezario
R&D Center Simulation Leader
WEG Electric Motors

ANSYS ACT Applications (ANSYS 17, Windows only) Show All PAID FREE

Acoustics 17.0
Version: 170.1
Target Application: **Mechanical**
Expose 3D acoustic solver capabilities

Advanced Enclosure 17.0
Version: 170.8
Target Application: **DesignModeler**
Create fluid enclosure and decompose it to sweepable bodies
[Contains source code]

Ansys Topology Optimization 17.0
Version: 170.1
Target Application: **Mechanical**
Expose Topology Optimization capabilities in Workbench Mechanical. Optimized model can be exported and edited in SpaceClaim for performing validation study and/or 3D printing

ACT Ecosystem

ACT General Introduction

Post My ACT App Request Page

Previous Releases

16.2 ACT Library

15.0 ACT Library

- Free and paid apps
- Ever expanding offering of applications
- Developed by ANSYS and third-parties
- Several ANSYS ACT videos
- Template Extensions and Training material available
- Full training videos

Accept the NSLA to download an app

- Non-Standard License Agreement

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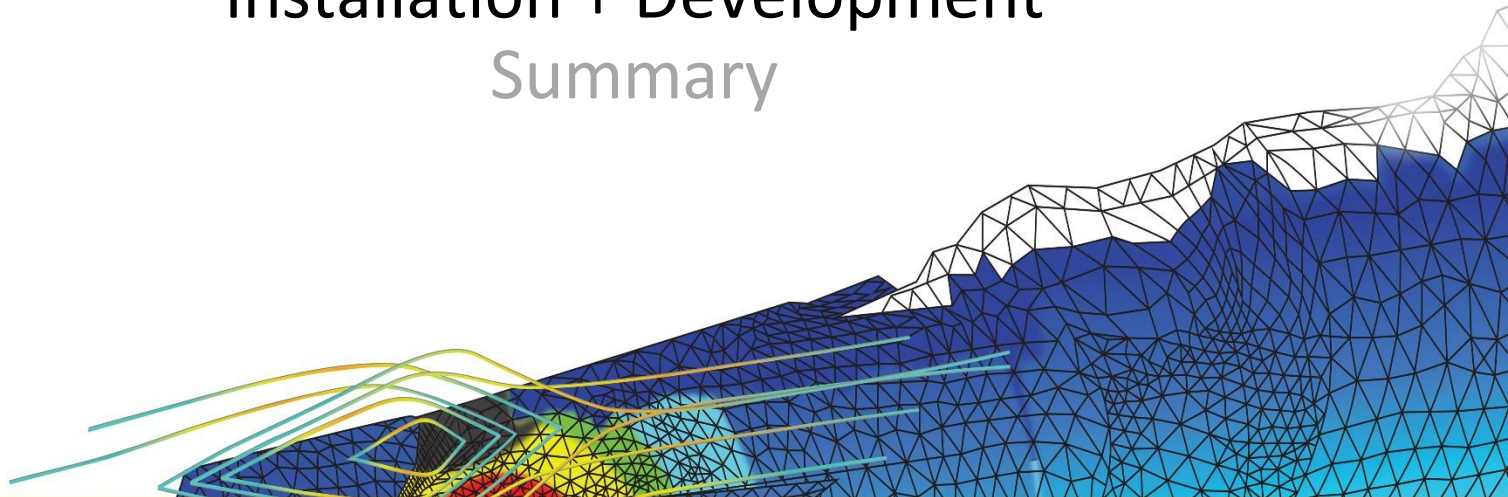
Application **C**ustomization **T**oolkit

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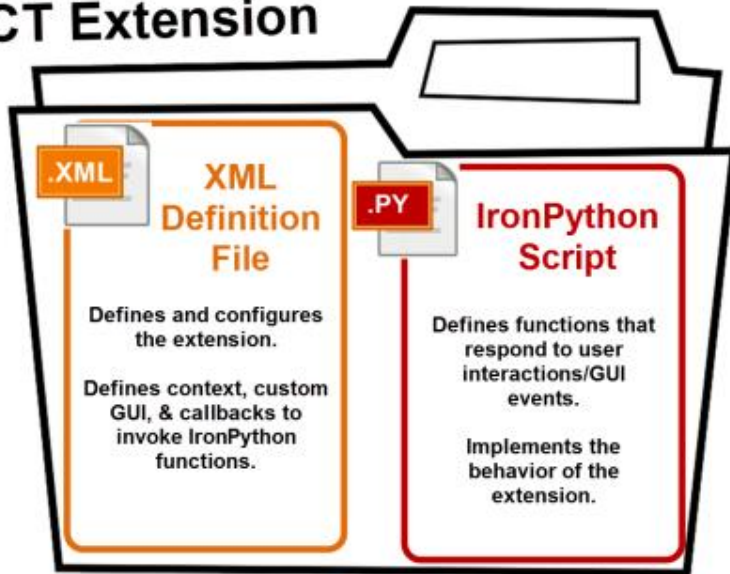
Installation + Development

Summary



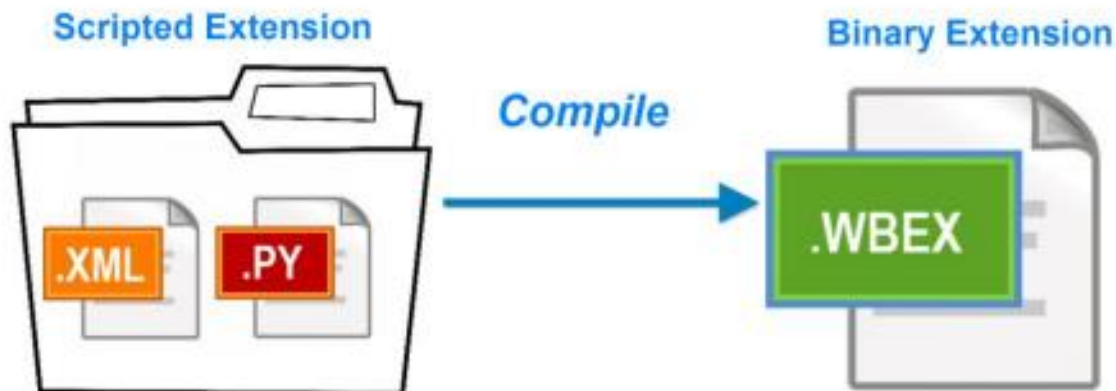
ACT extension structure

ACT Extension



In general,

- The creation of **scripted** extensions **require a license**
- The installation of **binary** extensions **typically does not require a license.**



ACT Components



Module used by “super users”
to develop extensions

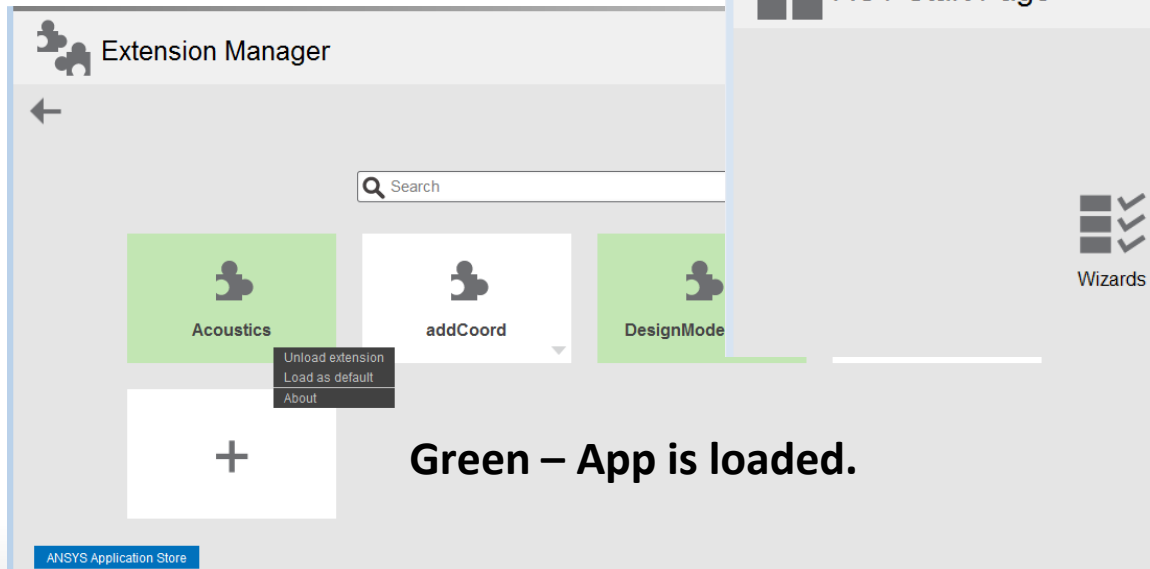
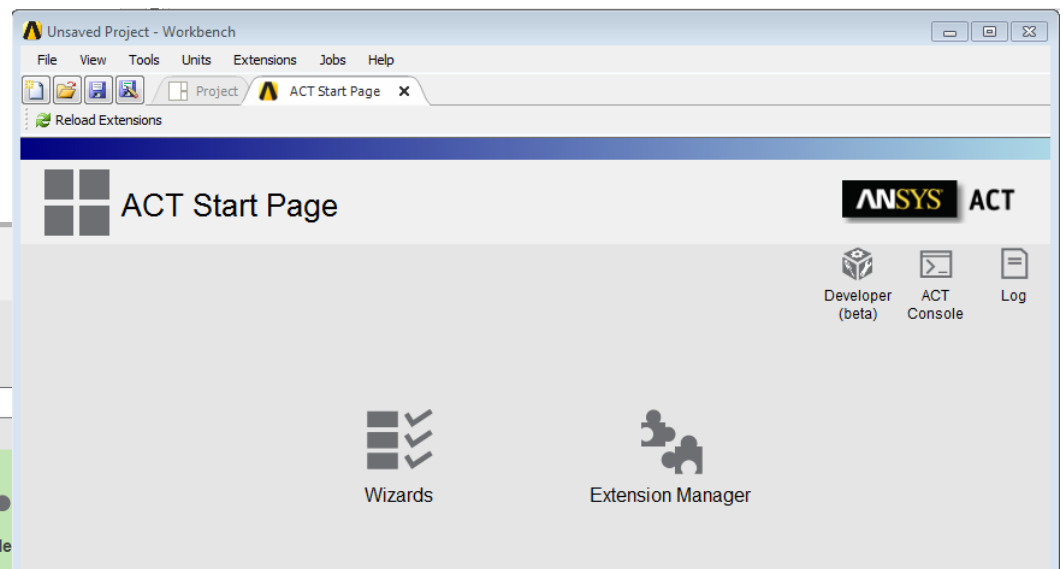
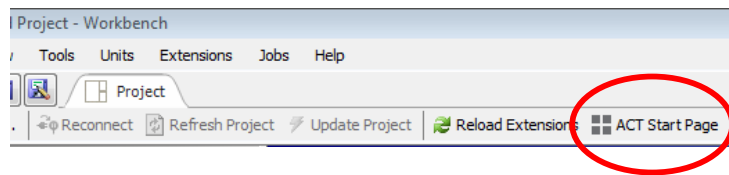
- Used to create ACT-based customizations or “extensions”
- **License managed**
- Maintained and supported by ANSYS

Files given to users to access the
enhanced functionality

- Then becomes visible to the end-user in the GUI
- Created extension under binary format (**no license**)
- **No special license required** to run the extensions (beyond the one to run ANSYS applications)
- Outside of ANSYS’s standard support model

ACT Start Page

- Provides consistent launching point for extensions and wizards
- Direct access to ACT console
- ACT start page is the first step in creating an IDE for App creation



ACT Console

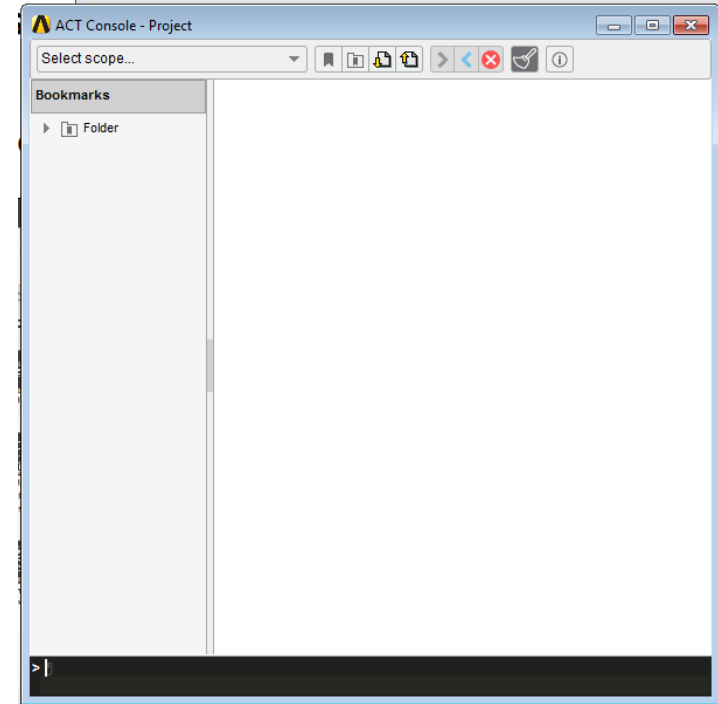


This ACT tool is

- installed along with the Workbench
- provides an interactive environment to help the ACT developers

This ACT tool enables you to

- Find out suitable commands for your extension
 - Tooltips and auto-completion
- Test code pieces even before developing an extension
- Debug developed extensions



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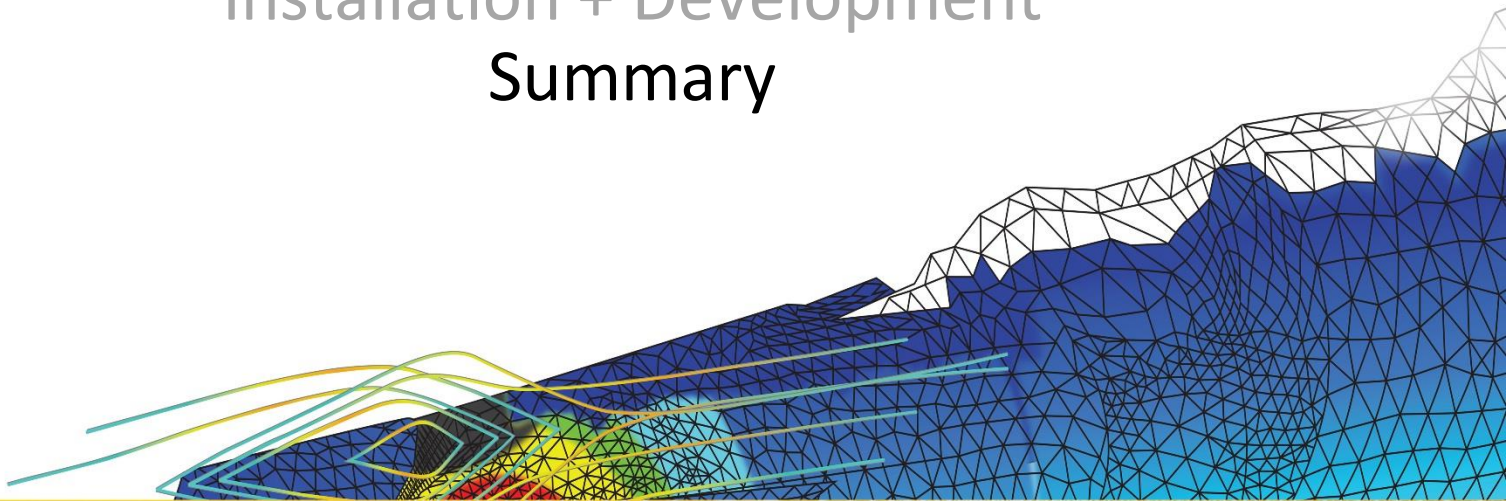
Application **C**ustomization **T**oolkit

Introduction

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Installation + Development

Summary



ACT – Summary

- ACT is the unique tool for the customization of all ANSYS applications
- ACT enables to meet application specific and multi-physics needs
 - Automate process with application specific customized interfaces
 - Add new pre-, post-features
 - Integrate external applications into Workbench
 - Offers both third-party and ANSYS product connections
- ACT offers Ease of use and Consistency
 - Customize all products with ONE consistent approach: same logic, same UI, same syntax (Python and XML)
 - APIs are documented and forward compatible
- ACT apps make complex simulations accessible to non-expert simulation users

ANSYS products that currently support ACT's customization capabilities – R17.0

Product	Simulation Workflow Integration	Feature Creation	Process Compression
Workbench	✓	✓	✓
AIM		✓	✓
DesignModeler		✓	✓
Mechanical		✓	✓
DesignXplorer		✓	✓
SpaceClaim			✓
Electronics Desktop			✓
Fluent (Beta)			✓
Fluent Meshing (Beta)			✓