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专题技术巡展

北京站6月21日　上海站6月23日

ANSYS ACT for Automotive CFD

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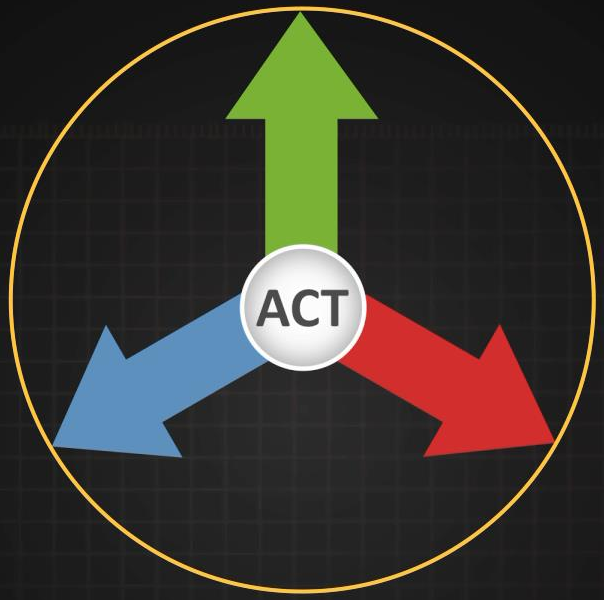
ANSYS Inc.

Introduction (Video)



Single approach simplicity:
ONE logic, ONE UI, and ONE syntax

Introduction

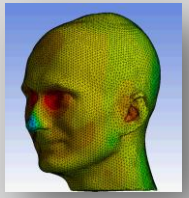
- ACT is the tool for the customization of all ANSYS applications

- 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

Customer Testimonials

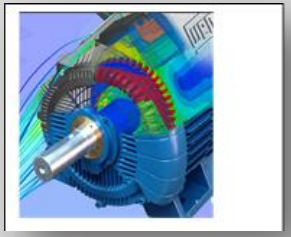


"…By making **complex physics**, such as acoustics and frequency dependent material mechanical models **accessible to non-expert simulation users** in an application specific environment, ACT enables Oticon's designers to perform design validations within ANSYS."

Martin Larsen,
Simulation Specialist,
Oticon A/S

"Automating the simulation process delivers high- performing, cost-efficient and robust products at the right price and within the design cycle timeframe. Using ANSYS Mechanical APDL with ANSYS ACT utilizes the power of the ANSYS Workbench with traditional APDL. This customization allows the Whirlpool team to employ simulation to **shorten design time, standardize processes and provide consistent and reliable results** regardless of the analyst's skill set."

Niyaz Ul Haque,
Deputy Manager,
Whirlpool Corporation



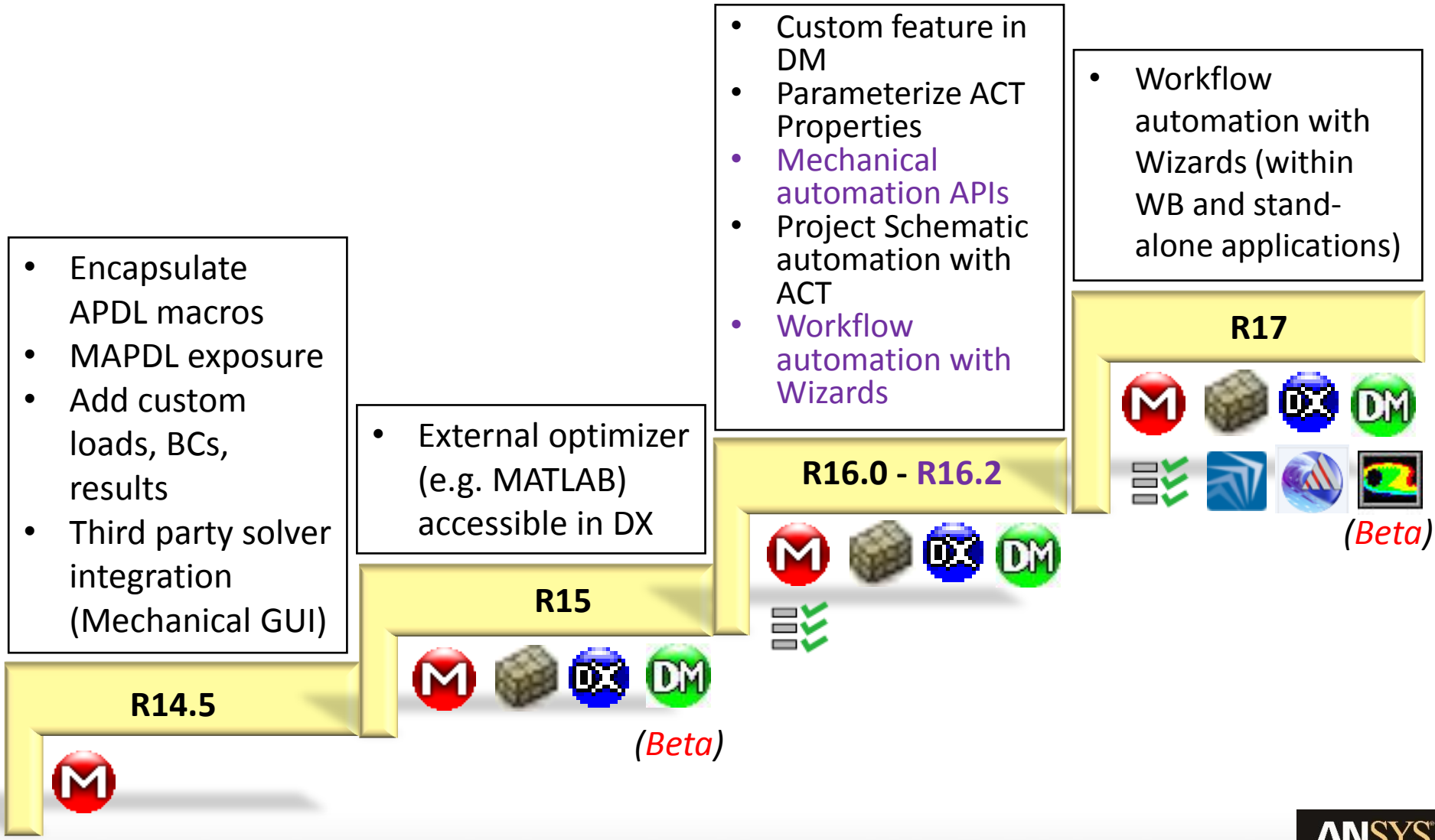
"When ANSYS developed ACT, it was a **giant step for industries**. This amazing tool can be an **instrument for sharing internal know-how**. For WEG, using ACT resulted in an instantaneous increase of knowledge."

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

Picatinny computer program saves time, money

PICATINNY ARSENAL, N.J. (July 25, 2013) -- By using software "extensions," scientists and engineers at Picatinny Arsenal now have a tool that transforms complex modeling and simulation programs into easy-to-learn software…The ability to reduce the complexity of software is the result of a partnership between the U.S. Army's Armament Research, Development and Engineering Center (ARDEC) at Picatinny and software developer ANSYS, Inc.

Product Coverage



ACT Basics

ACT Components

- **ACT Module (the development toolkit)**
- Used to create ACT-based customizations or “extensions” or “apps”
- License managed (ACT license)
- Maintained and supported by ANSYS

XML + Python files

Users: Extension developer

- **ACT Extensions (the resulting customizations)**
- What becomes visible to the end-user in the GUI (similar to UDF)
- Created extension is binary format
- Outside of ANSYS’s standard support model
- Don't need a license (beyond the one to run the ANSYS product) to use the extensions

WBEX file

Users: ANSYS customers

ANSYS ACT “App Store”

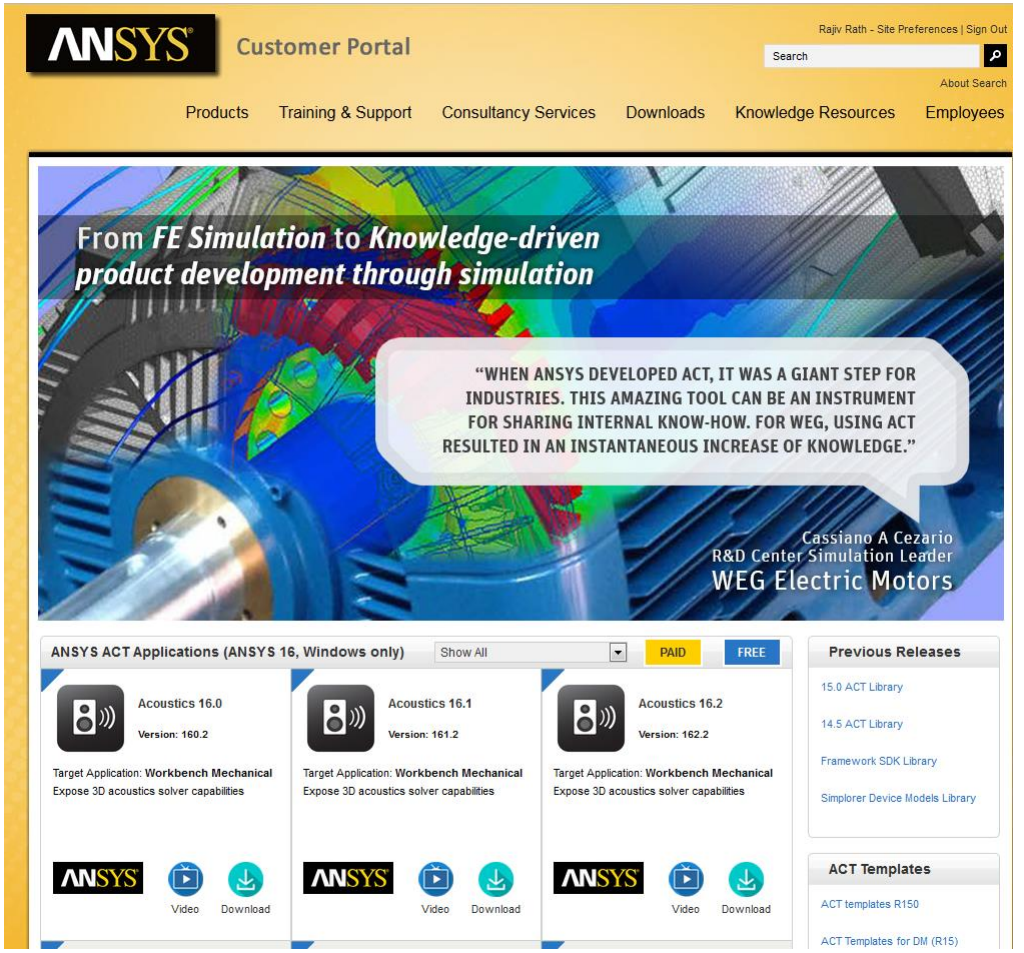
- **Access via Customer Portal:**

https://support.ansys.com/AnsysCustomerPortal/en_us/Downloads/Extension+Library

- **Free and paid ANSYS Apps**
  - **Simple “extensions” through complete vertical Apps**

- **ANSYS and third-party apps are available for download**

- **Customers accept click-wrap NSLA (Non-Standard License Agreement) for downloading an app**



About 150 apps being downloaded each day!

Selective APPs Available on ANSYS Customer Portal

Advanced Enclosure

Version: 5.0

Target Application: **Workbench DesignModeler**
Create fluid enclosure and decompose it to sweepable bodies

CADFEM Russia

Download

Custom Update 16.0, 16.1, 16.2

Version: 2.1

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

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CFX2Fluent

Version: 1.0

Target Application: **Workbench Project Schematic**
Connect CFX Setup with Fluent Setup for extended, automatable CFD analysis within the ANSYS Workbench Project Schematic

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MATLAB Optimizers for DX

Version: 2.1

Target Application: **DesignXplorer**
Expose MATLAB optimization algorithms and user programs in the Optimization component of ANSYS DesignXplorer
[Contains source code]

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Mixing Guided Process Template

Version: 1.0

Target Application: **Workbench 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

ANSYS

Video Info

Pump Modeler Template 16.0

Version: 1.0

Target Application: **Workbench Wizard**
Provide easy-to-use and automated workflow for creating gerotor pump geometry decomposition, mesh setup and running simulations with cavitation in ANSYS Fluent and generating comprehensive custom pump report

ANSYS

Video Info

ACT Examples for Automotive CFD

➢ Flow Modeler

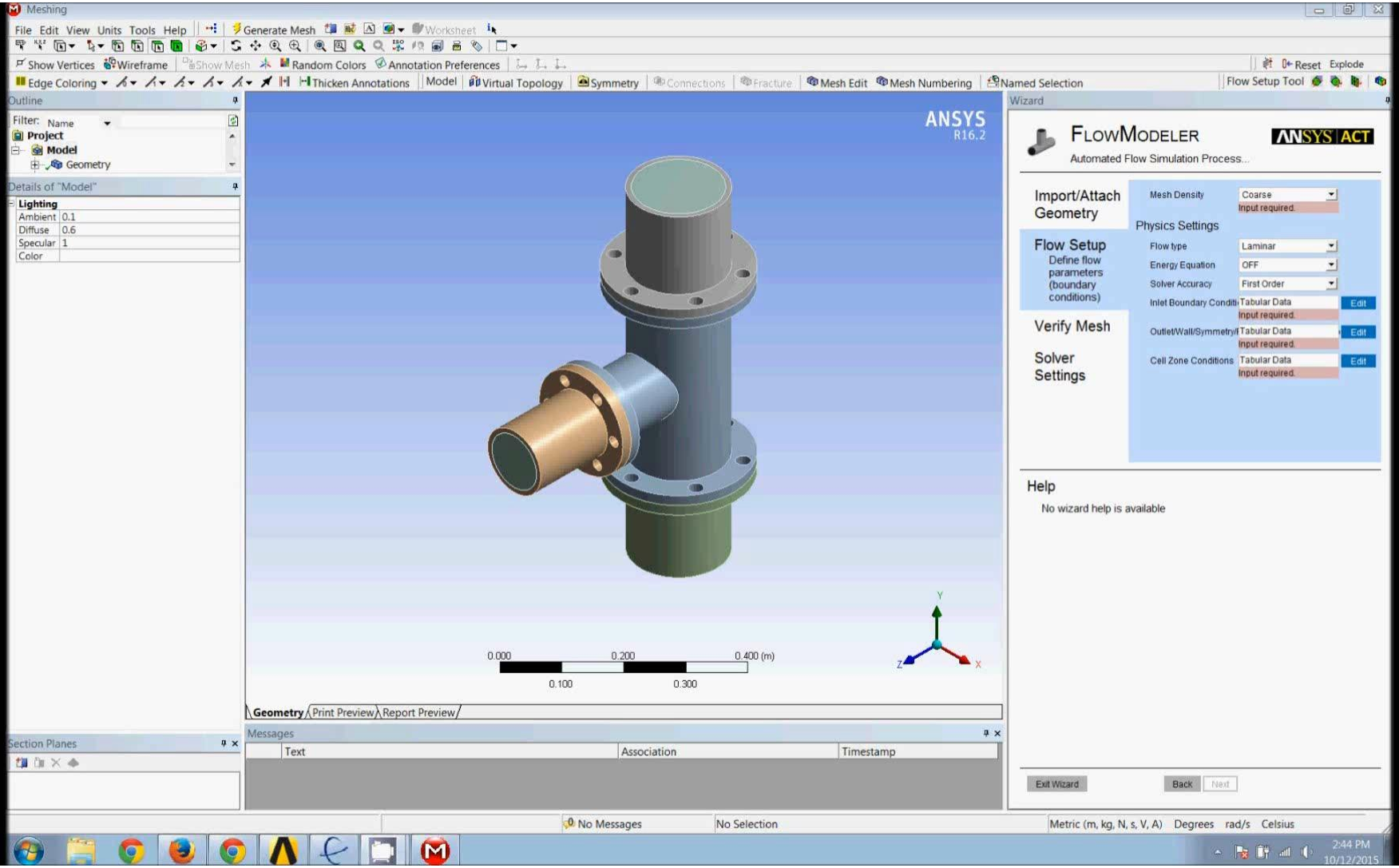
- Create streamlined workflow to enable non-expert users perform numerical analysis
- Capture and distribute best practice and simulation process for standard applications

➢ Thermal Comfort

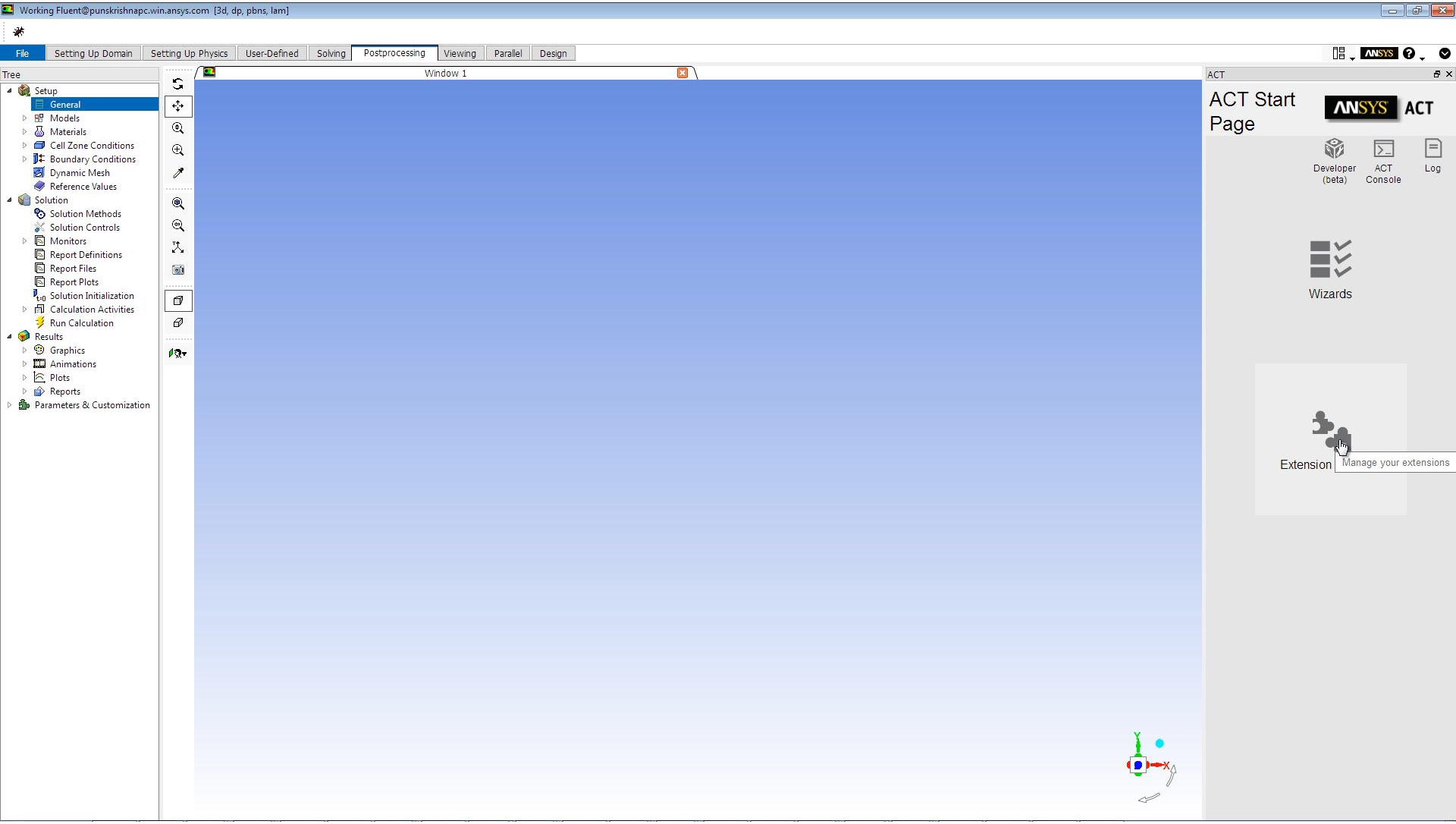
- Add specific numerical models for unique applications
- Automate the simulation process to increase productivity and avoid possible human error
- Customer can create their APP with the help from ANSYS Service Team.

➢ Vehicle ACT

FlowModeler APP



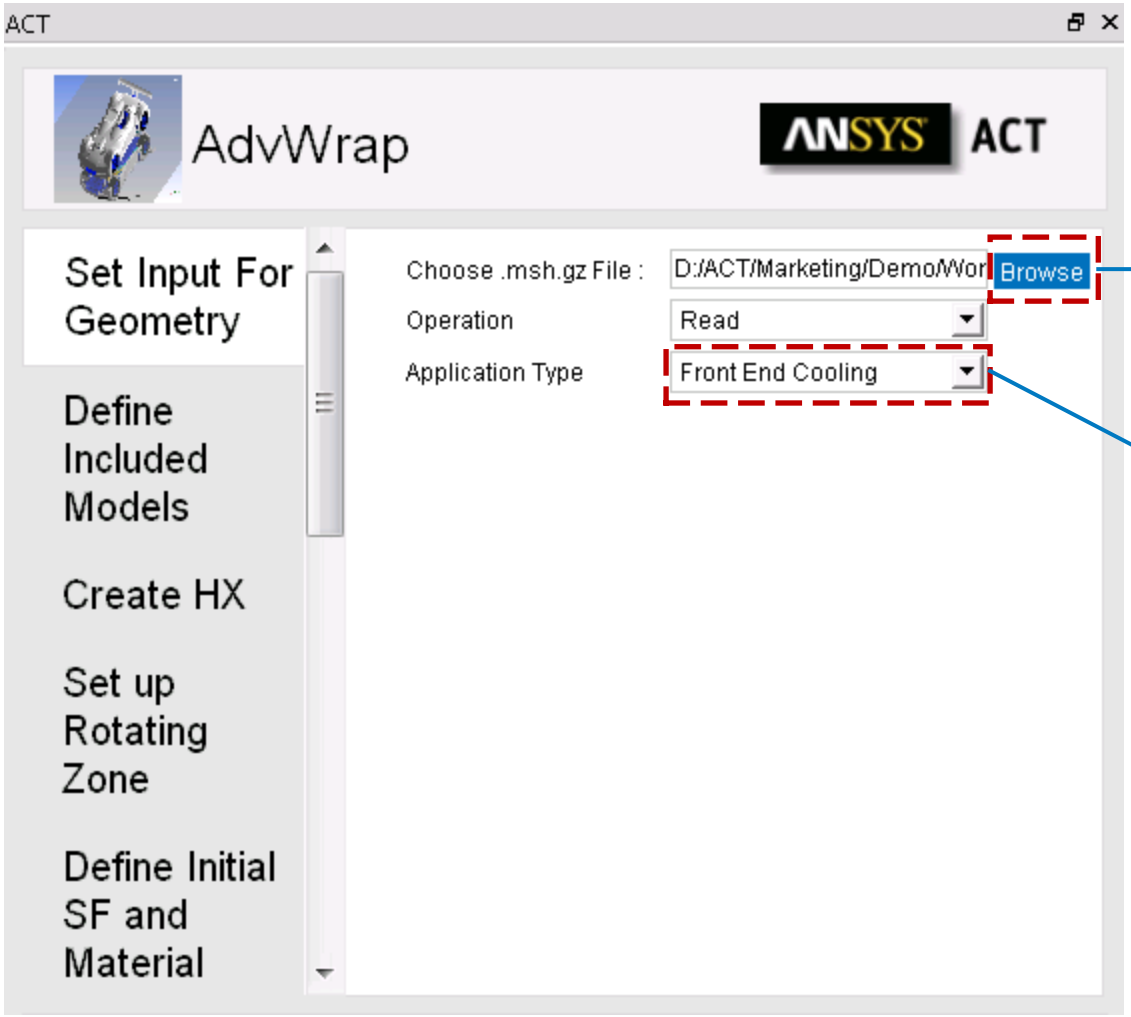
ThermalComfort APP



ACT for Vehicle Level CFD Applications

- **Two major classes of vehicle level applications**
  - External Aero – Vehicle aero performance analysis
  - Underhood Thermal Management (UTM) – Vehicle thermal performance under various operating conditions
    - Basic UTM, also known as Front End Cooling (FEC) – Front end flow distribution and heat exchanger performance
    - Full UTM – Superset of FEC. Fully coupled Conjugate Heat Transfer (CHT) thermal analysis on entire vehicle
- **Challenges in vehicle level applications**
  - Preprocessing – Complex geometry, dirty CAD, high requirements on Meshing
  - Complex numerical models and boundary condition
  - Fast turnaround
  - Multi-discipline Optimization
- **ACT for Vehicle Applications**
  - Integrated and streamline workflow for both External Aero and UTM
  - Semi-automated meshing and case setup process
  - Apply best practice on various applications
  - Possible to achieve full automation with deep customizations

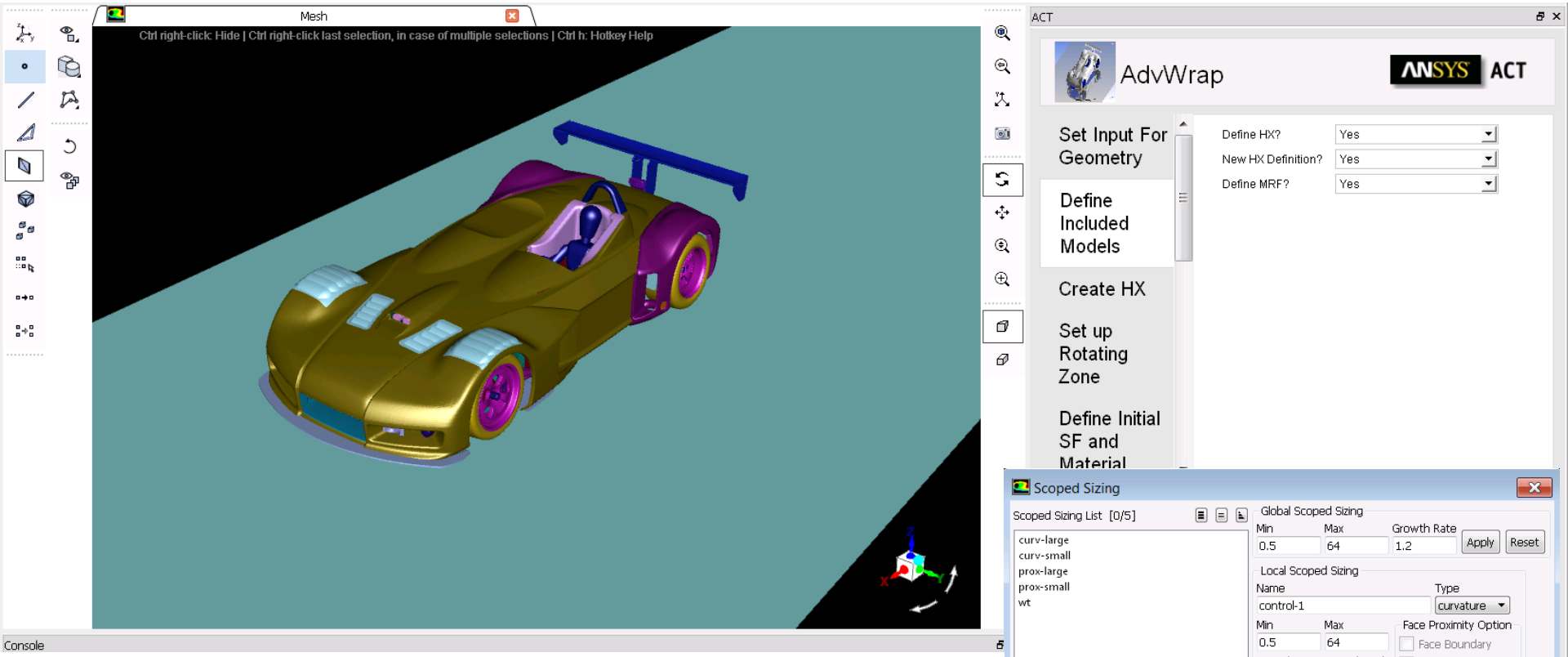
Step1 – Read in Geometry



Browse to find the input file

Define application type

Define Essential Models



- Interactive review the model if necessary
- Include heat exchangers and rotating fans if needed
- Heat exchangers and rotating fans are defined through excel sheets
- Define mesh size
- Full automation can be achieve through deeper customization

Settings Through Excel Sheets

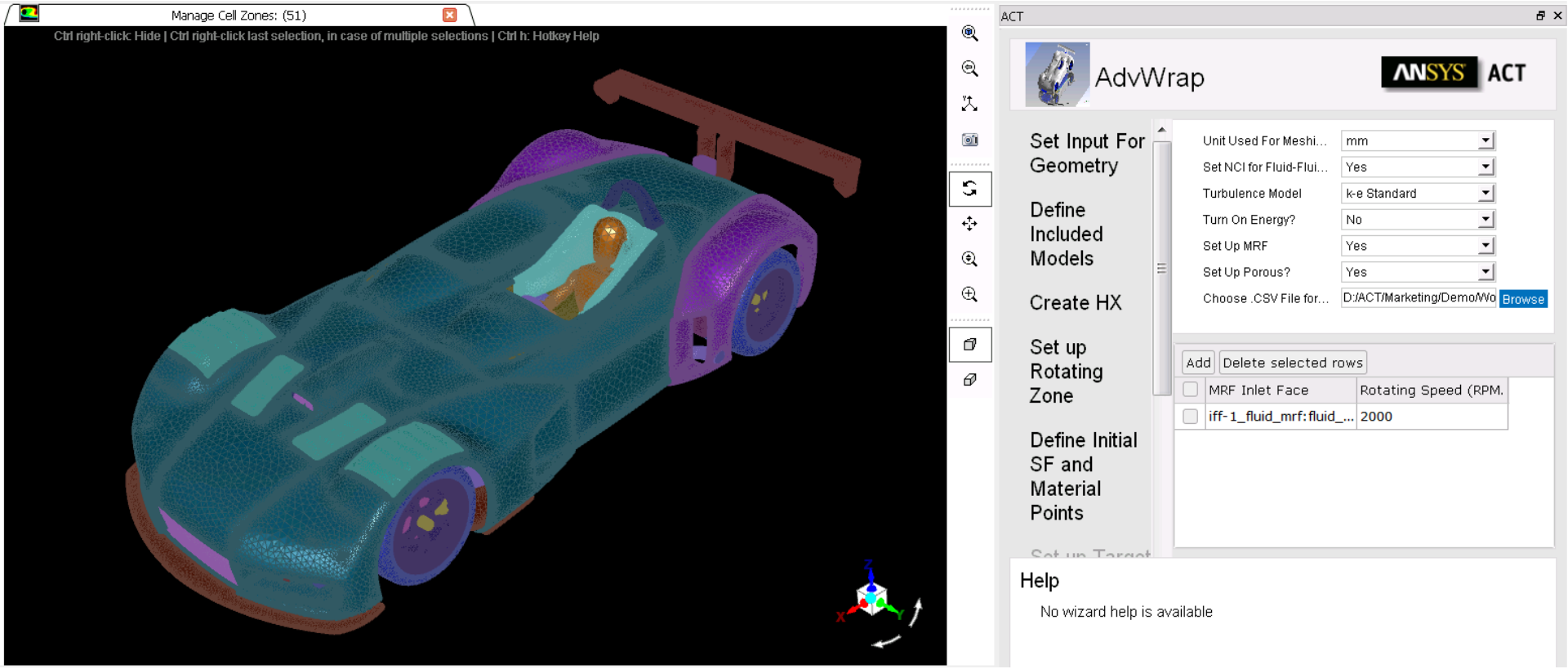
	A	B
1	Working Directory	D:\ACT\Marketing\Demo
2	Heat Exchanger Name	rad
3	Heat Exchanger Inlet Bottom Right x	83.60191038
4	Heat Exchanger Inlet Bottom Right y	134.4488189
5	Heat Exchanger Inlet Bottom Right z	19.03897451
6	Heat Exchanger Inlet Bottom Left x	83.60191038
7	Heat Exchanger Inlet Bottom Left y	-134.4488189
8	Heat Exchanger Inlet Bottom Left z	19.03897451
9	Heat Exchanger Inlet Top Right x	232.5354331
10	Heat Exchanger Inlet Top Right y	134.4488189
11	Heat Exchanger Inlet Top Right z	123.3233498
12	Heat Exchanger Outlet Bottom Right x	72.98848813
13	Heat Exchanger Outlet Bottom Right y	134.4488189
14	Heat Exchanger Outlet Bottom Right z	34.19651234
15	Number of Division in Heigth (bottom->top)	50
16	Element Size in Heigth	5.377952756
17	Number of Division in Width (left->right)	35
18	Element Size in Width	5.19469314
19	Number of Division in Thickness (inlet->outlet)	5
20	Element Size in Thickness	3.700787402
21	Inlet->Outlet norm x	-0.573576436
22	Inlet->Outlet norm y	0
23	Inlet->Outlet norm z	-0.819152044
24	Top->Bottom norm x	148.9335227
25	Top->Bottom norm y	0
26	Top->Bottom norm z	104.2843753
27	Viscous Resistance	10
28	Inertial Resistance	20

1	Working Directory	D:\ACT\Marketing\Demo
2	MRF Cell Zone Name	mrf
3	Rotating Center X	0.000982347
4	Rotating Center Y	0.018559999
5	Rotating Center Z	0.0015
6	Rotating Norm X	0
7	Rotating Norm Y	-1
8	Rotating Norm Z	0
9	Rotating Speed RPM	2000

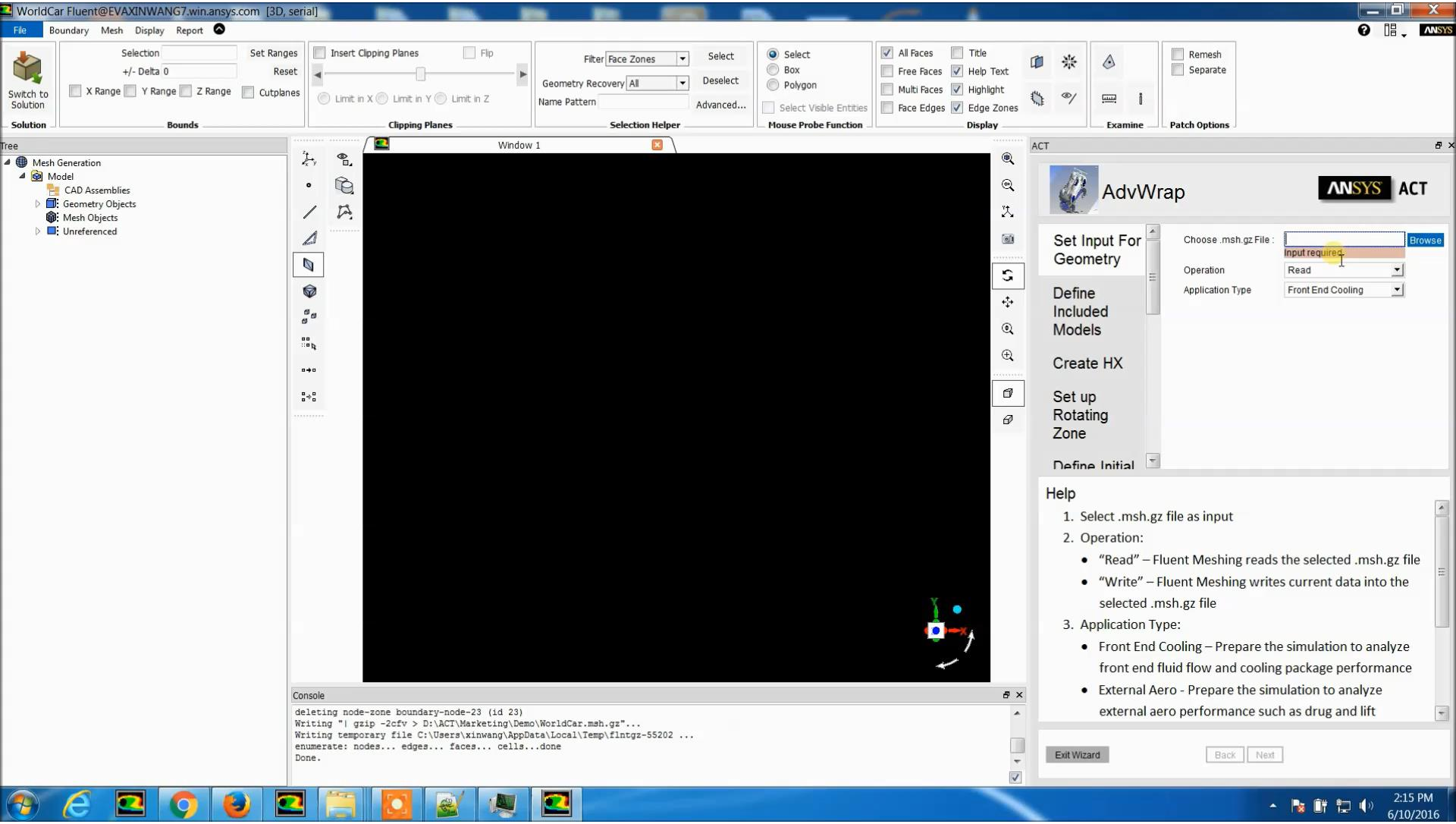
1	Working Directory	D:\ACT\Marketing\Demo		
2	Input File	WorldCar.msh.gz		
3	Compute Size Field?	yes		
4	Size Control for Wrapping	WorldCar-initial.szcontrol		
5	Size Control for Surface Meshing	WorldCar-target.szcontrol		
6	Use Size Ratio for Surface Meshing?	yes		
7	Coarsening Factor	1.5		
8	Sharp Angle Object List			
9	Dirty Object Name	engine	trans	
10	Dirty Object Leakage Size Threshold	32	32	
11				
12	Dead Regions	eng-1	eng-2	eng-3
13	Dead Regions Leakge Size Threshold	32		
14				
15	Wrap Regions	fluid_main		
16				
17	Volume Fill Regions	fluid_main	fluid_mrf	
18	Prism?	yes	yes	
19	Tet/Hexcore?	tet	tet	
20				
21	Tet Over Boundary Size Ratio	1.5		
22				
23				
24	Prism Settings			
25	Number of Prism Layers	2		
26	Prism Growth Method	First Layer Aspect Ratio and Growth Rate		
27	Last Ratio Percentage	40		
28	First Layer Heigth	0.01		
29	First Layer Aspect Ratio	10		
30	Prism Growth Rate	1.2		

Provide settings for meshing and simulation through excel with minimum inputs.
The Excel templates are 90% prefilled.
User defined settings are saved for re-run and design changes.

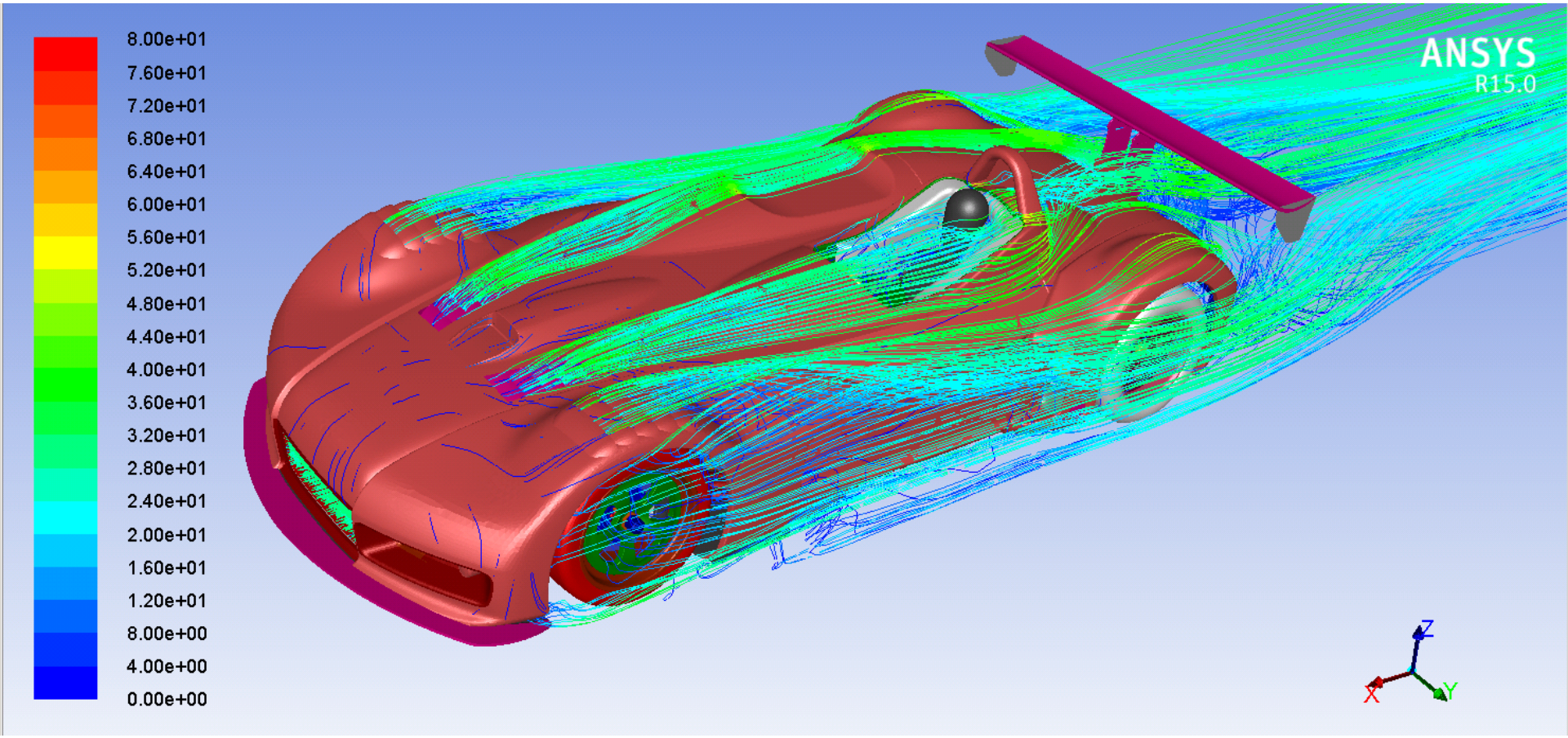
Prepare for solve



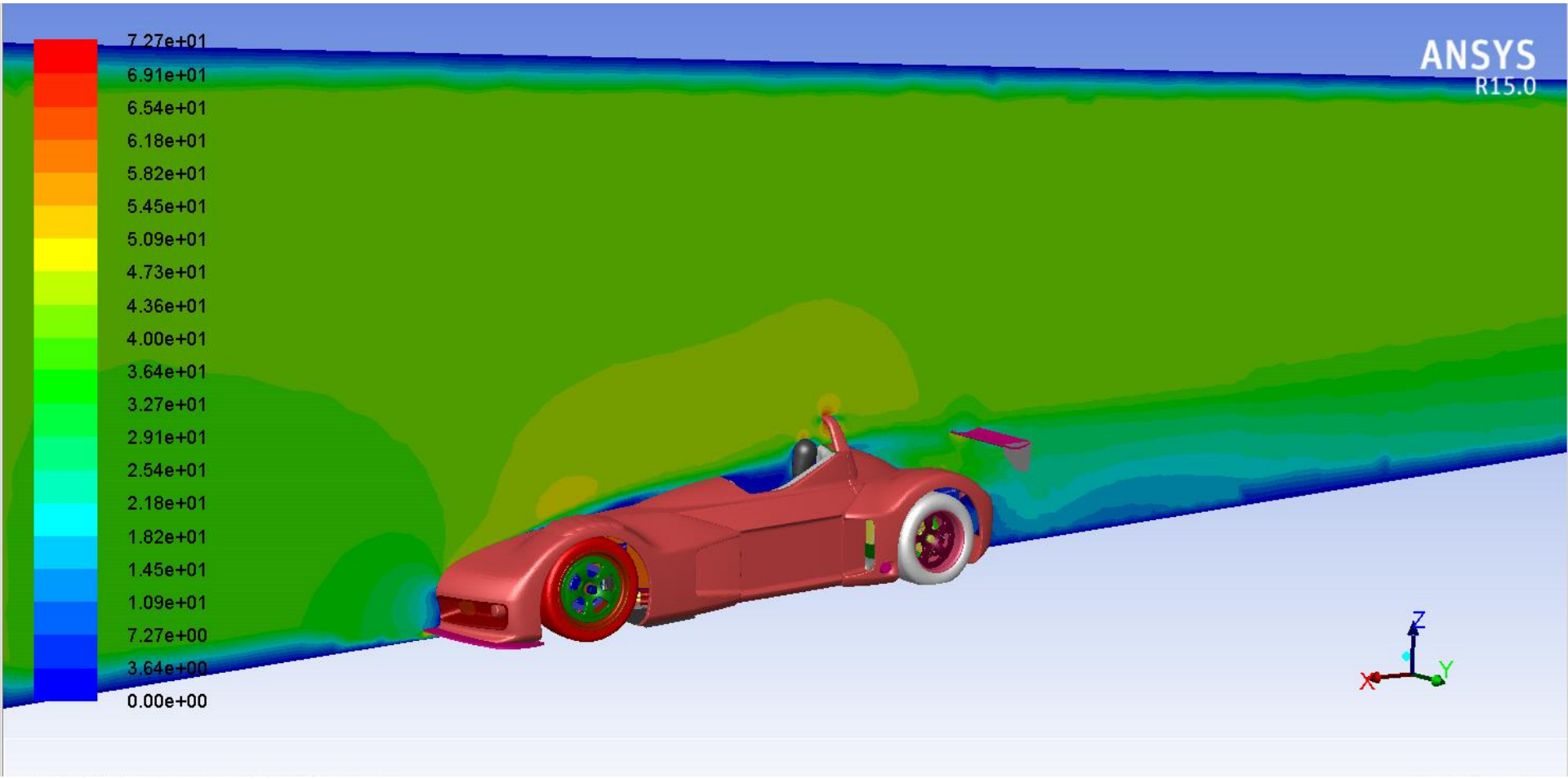
Video Demo


WorldCar Fluent@EVAXINWANG7.win.ansys.com [3D, serial]
File
Boundary
Mesh
Display
Report
Switch to Solution
Solution
Selection
+/- Delta 0
Set Ranges
Reset
X Range
Y Range
Z Range
Cutplanes
Bounds
Insert Clipping Planes
Flip
Limit in X
Limit in Y
Limit in Z
Clipping Planes
Filter
Face Zones
Select
Geometry Recovery
All
Deselect
Name Pattern
Advanced...
Selection Helper
Select
Box
Polygon
Select Visible Entities
Mouse Probe Function
All Faces
Free Faces
Multi Faces
Face Edges
Title
Help Text
Highlight
Edge Zones
Display
Examine
Remesh
Separate
Patch Options
Tree
Mesh Generation
Model
CAD Assemblies
Geometry Objects
Mesh Objects
Unreferenced
Window 1
ACT
AdvWrap
ANSYS ACT
Set Input For Geometry
Define Included Models
Create HX
Set up Rotating Zone
Define Initial
Choose .msh.gz File :
Browse
Input required.
Operation
Read
Application Type
Front End Cooling
Help
1. Select .msh.gz file as input
2. Operation:
• "Read" – Fluent Meshing reads the selected .msh.gz file
• "Write" – Fluent Meshing writes current data into the selected .msh.gz file
3. Application Type:
• Front End Cooling – Prepare the simulation to analyze front end fluid flow and cooling package performance
• External Aero - Prepare the simulation to analyze external aero performance such as drug and lift
Exit Wizard
Back
Next
Console
deleting node-zone boundary-node-23 (id 23)
Writing "| gzip -2cfv > D:\ACT\Marketing\Demo\WorldCar.msh.gz"...
Writing temporary file C:\Users\xinwang\AppData\Local\Temp\fltgz-55202 ...
enumerate: nodes... edges... faces... cells...done
Done.
2:15 PM
6/10/2016

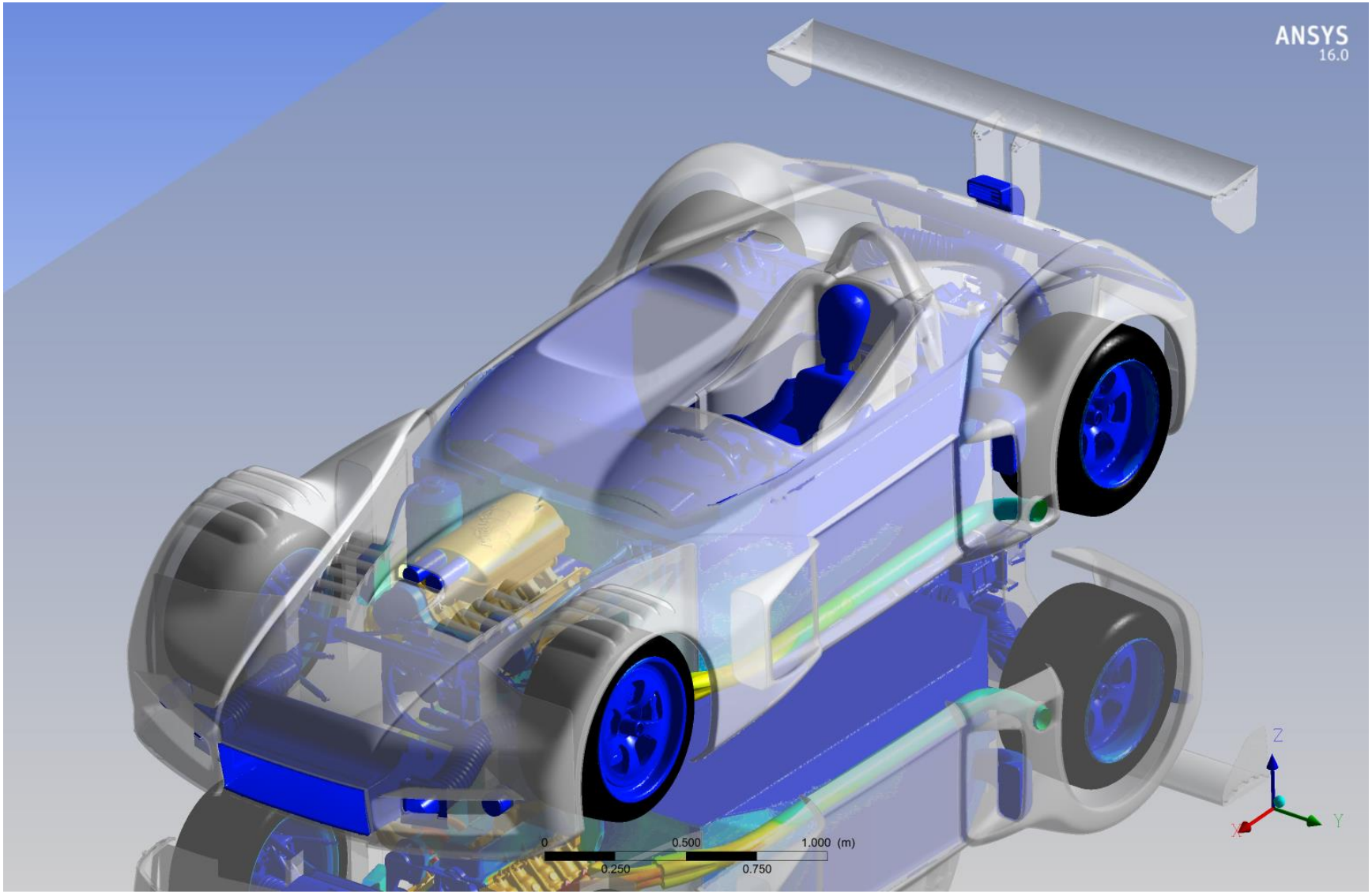
Results – External Aero



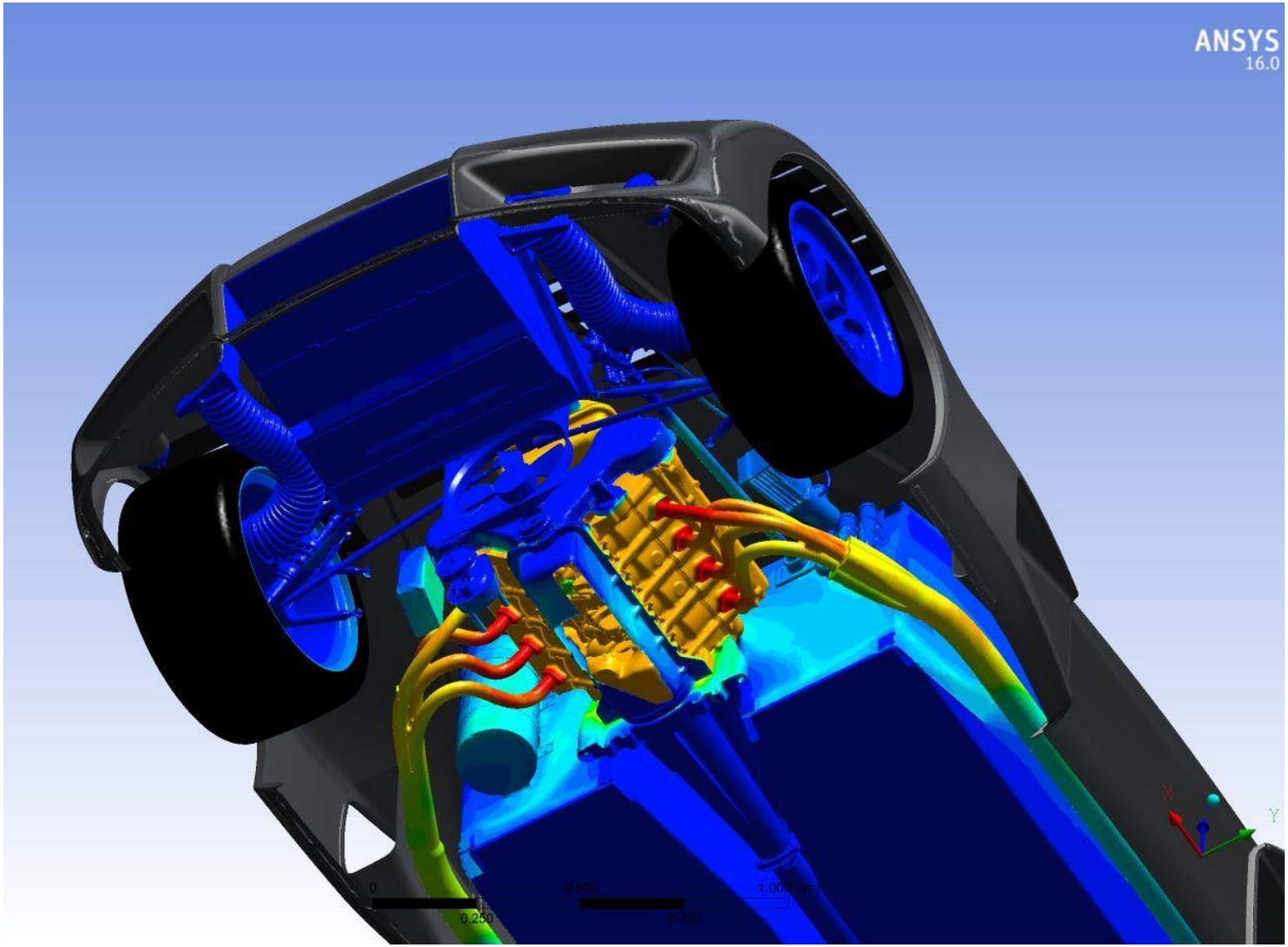
Results – External Aero



Results – UTM



Results – UTM



Conclusion

- ACT is the single customization tool for all ANSYS products under ANSYS Workbench platform
- ACT can seamlessly tack industry-specific multi-physics applications
- Wide product coverage
- Third party application integration
- Enhanced workflow