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Getting Started with ACT

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Getting Started with ACT

Ansys offers class-leading, off-the-shelf simulation technologies. To most effectively deploy pervasive simulation, you may desire a more curated experience to match our simulation expertise with your user, company, or industry needs. Ansys ACT equips you with the power to customize and extend the Ansys experience.

This section helps you to get started with ACT by answering these questions:

- [What is customization?](#)
- [What is extensibility?](#)
- [What is ACT?](#)
- [What capabilities does ACT provide?](#)
- [What skills are required for using ACT?](#)
- [How do I begin using ACT?](#)
- [Where can I find published ACT apps?](#)

What is customization?

Customization is the in-product operation of modifying existing functionality and exposing brand new features. The goal of customization is to alter an existing user experience to match the needs of the user.

What is extensibility?

Building on customization, extensibility operates at a higher level of custom user experience, out-of-product feature exposure, and vertical applications. The goal of extensibility is to reliably and consistently enhance a software package with minimal development and maintenance effort. To extend Ansys software, you create extensions that add and modify functionality while minimizing the impact on existing functionality.

What is ACT?

ACT is a unified and consistent toolkit for customizing and extending Ansys products, providing the fastest and easiest way to create simulation engineering apps that meet your specific needs. While tailoring simulation applications to fit your use has traditionally been complex and time-consuming, ACT simplifies this process, allowing you to focus more on simulation analysis than on customizing software.

ACT uses easy-to-learn yet powerful eXtensible Markup Language (XML) and IronPython programming languages. Even if you are a non-expert user, you can create custom apps for your advanced workflows. Unlike typical software programming, ACT does not require a commercial Integrated Development Environment (IDE). Instead, it provides an intuitive development environment with tools, documentation, and lots of examples to guide you through the process. With ACT, you can create customizations in only hours or days instead of weeks or months.

Many Ansys products expose their own scripting solutions. However, ACT provides a single scripting solution for customizing all Ansys products. You can mix ACT APIs (Application Programming Interfaces) with product-specific APIs without needing to compile external code or link with existing Ansys libraries. Additionally, ACT enables you to manage the interfaces between these products and the additional customizations, ensuring that they all interact accurately.

ACT's intuitive APIs and simple app creation tools capture the best practices of expert engineering analysts, thereby reducing training and implementation costs and enabling a broader range of engineers and designers to effectively use simulation tools. By fostering a unified simulation workflow, ACT allows you to integrate your non-Ansys engineering tools and data into the Ansys ecosystem to maximize the productivity of your engineering teams. Leverage these streamlined simulation workflows for faster and better decisions throughout the entire product life cycle, from concept to product use.

What capabilities does ACT provide?

While Ansys provides comprehensive engineering simulation solutions across all physics areas, you are likely to have business-specific needs that are not native to Ansys products. To tailor Ansys products to meet these needs, ACT provides customization capabilities, categorized into three types:

- [Feature Creation](#)
- [Simulation Workflow Integration](#)
- [Process Compression](#)

Note: For additional information about ACT, including "roadmaps" designed to guide you through the steps of creating the desired type of ACT customization for an Ansys product, the **ACT Ecosystem** tab on the [App Developer Resources page](#) displays **ACT Overview** links for various Ansys versions. Clicking a link takes you to the version-specific Ansys Help, which requires customer account login.

Feature Creation

Feature creation is the direct, API-driven *customization* of Ansys products. In addition to leveraging the functionality already available in a product, ACT enables you to add functionality and operations of your own. Your custom additions operate as "native" features in the target Ansys product.

Feature creation examples include:

- Creating custom loads and geometries
- Adding custom preprocessing and postprocessing features
- Integrating third-party solvers, sampling methods, and optimization algorithms

These Ansys products support feature creation:

- DesignModeler
- DesignXplorer
- Fluent
- Mechanical
- Workbench

Feature creation capabilities common to all these products include user interface entry creation, ACT-based property creation, and property parameterization. Product-specific feature creation capabilities are described in the ACT customization guide for the product, which can be found in the Ansys Help.

A few examples follow of feature creation in various Ansys products:

- DesignModeler
 - Define new user interface elements to execute custom actions
 - Expose new geometry features
- Fluent
 - Deploy your own UDFs with ACT UDF macro encapsulation
- Mechanical
 - Integrate your legacy APDL macros with APDL encapsulation
 - Develop your own criterion using IronPython and integrate it into the powerful Mechanical Post environment
 - Add new boundary conditions, preprocessing and postprocessing algorithms, and custom results
 - Define new user interface elements to execute custom actions
- Workbench
 - Define new user interface elements to execute custom actions

Feature creation also includes the integration of custom solvers and sampling and optimization algorithms. For example, you can:

- Integrate new sampling and optimization methods in DesignXplorer. ACT enables you to extend the existing set of Ansys-supplied sampling and optimization algorithms with your own in-house,

third-party, or commercial strategies. You can then select these integrated methods from DesignXplorer's setup properties.

- Integrate custom solvers directly in Mechanical. By embedding your solvers into Mechanical simulations, you can create new Workbench analysis systems based on your technologies. Within Mechanical, the solver operates seamlessly with the processing routines for the native mathematical model, solver, and results processing.

Simulation Workflow Integration

Simulation workflow integration is the incorporation of external knowledge such as apps, processes, and scripts into the Ansys ecosystem. With ACT, you can create custom simulation workflows that can be inserted on the flowchart-like schematic in Workbench.

An engineering simulation workflow is a sequence of actions performed on well-defined data to obtain insightful results. A typical simulation workflow can be broken down into five steps:

1. Define or retrieve input data
2. Prepare for execution
3. Run the process
4. Generate output data
5. Publish results

With ACT, you define each workflow step as a custom task (component) and then combine multiple custom tasks into a custom task group (system). You can then insert custom task groups on the Workbench **Project Schematic** to construct consistent and cohesive simulation workflows, allowing your business-specific elements to coexist and interface with pre-built Ansys solutions. Currently, Workbench is the only Ansys product to support simulation workflow integration. For more information, see the *Ansys ACT Customization Guide for Workbench*, which can be found in the Ansys Help.

You can use integrated workflows for various simulation scenarios, performing custom behaviors such as specialized data processing, report generation, and application synchronization to manage and integrate heterogeneous processes and tools into your Ansys simulation environment. By using ACT to integrate diverse data generated from in-house and commercial engineering software products into your Ansys environment, you can improve your product lines and innovate faster.

Examples follow of using custom workflows to integrate external data and applications:

- Maintain or reuse data from an external application, such as a CAD system. With ACT, you can automate the process of mapping and linking to this data to save time and reduce errors, greatly improving productivity. Additionally, you can use ACT to batch process the generation of images and reports from your model results.

- Expose external applications and data with custom workflows in Workbench to achieve:
 - Native "OEM" look and feel
 - Professional-grade application deployment
 - Project data and file management solutions
 - Collaboration with industry-leading applications
 - Flexible project construction
 - Remote Solve Manager (RSM) job submission to send large jobs to more powerful remote high-performance machines

Process Compression

Process compression is the encapsulation and automation of processes available in one or more Ansys products. The result is a *simulation wizard*, which incorporates your best practices to reliably guide non-expert users step-by-step through a complex simulation to produce desired results quickly. This type of ACT customization provides the greatest breadth because wizards simplify complex processes, allowing them to be repeated whenever needed. You can create wizards for these Ansys products:

- DesignModeler
- DesignXplorer
- Electronics Desktop
- Fluent
- Mechanical
- SpaceClaim
- Workbench

With wizards, you can manipulate existing features and simulation components, organizing them as needed to produce a custom automated process. A wizard can compress and automate processes within a single Ansys product to manage complex model interactions for one physics area. Or, a wizard can compress and automate processes of multiple Ansys products and even external applications for complex multi-physics simulations. By using wizards to simplify the analytical process, you boost the performance of the entire enterprise.

Wizards allow you to leverage both the existing functionality of Ansys products and the scripting capabilities of the Workbench framework API. For example, you can copy a journal of the steps that you take in an Ansys product into an ACT script and then parametrize the syntax to make the script generic for reuse.

The degree of automation possible depends on the product being customized. Examples of a Workbench-based project wizard and a mixed wizard appear in this guide. Examples of wizards specific to an Ansys product are described in the ACT customization guide for the product, which can be found in the Ansys Help.

Because simulation workflows are often so complex, the use of simulation tends to be limited to only a few expert users, reducing the overall efficiency of the engineering process. The need to satisfy process compliance requirements and ensure data integrity adds even more complexity. Using wizards, you can leverage the knowledge of your engineering process experts by compressing your business-specific processes into streamlined, simple-to-follow steps. Because each step exposes only the critical information required to ensure successful simulation, wizards shield users from technical complexities.

What skills are required for using ACT?

The development of ACT apps requires some knowledge of XML and IronPython. An ACT app begins as a scripted extension consisting of an XML file that defines and configures the content of the extension and at least one IronPython script that defines the functions invoked by user interactions, implementing the extension's behavior.

With ACT's standard XML and IronPython approach for all Ansys products, app creation is easy to learn, regardless of the Ansys products that you plan to customize. Apply the same consistent framework and APIs to meet your customization objectives and workflows.

The **ACT App Builder** makes creating and editing XML files and IronPython scripts even easier. Rather than manually performing these app-building actions, you can use this tool to automatically generate reusable scripts for customization in an interactive environment, without having to write code. Built-in journal recording eliminates manual callback programming and property substitutions, dramatically simplifying and speeding up customization. Intuitive property definition and processing specific to supported Ansys products breaks down barriers to scripting. Use of the **ACT App Builder** ensures easier, faster, and cheaper development of ACT apps.

For apps that customize Ansys solvers, knowledge of APDL is required. Additionally, advanced users can take advantage of the opportunities of .NET integration and support provided by IronPython. If you are interested in specific members or code methods, the **ACT Console** is a convenient tool to interactively navigate the APIs through robust autocompletion.

How do I begin using ACT?

The **ACT Start Page** provides a central place from which to access the many tools that ACT provides for developing, debugging, and executing extensions. From here, you can access the **ACT Console**, which exposes the ACT APIs. As a novice, you can discover APIs and write small and simple scripts for automating routine tasks that you perform within an Ansys product. As your experience and confidence grows, you can write full-fledged extensions that customize and extend Ansys products.

The **Extension Manager** provides for installing and loading extensions. The **Wizards launcher** starts simulation wizards, and the binary extension builder creates compiled binary files from scripted extensions. With tools like the **ACT App Builder**, **ACT Debugger**, and **ACT Workflow Designer**, modifying existing Ansys functionalities and adding new custom functionalities and workflows is easy, giving you the power to decide how Ansys products should look and behave.

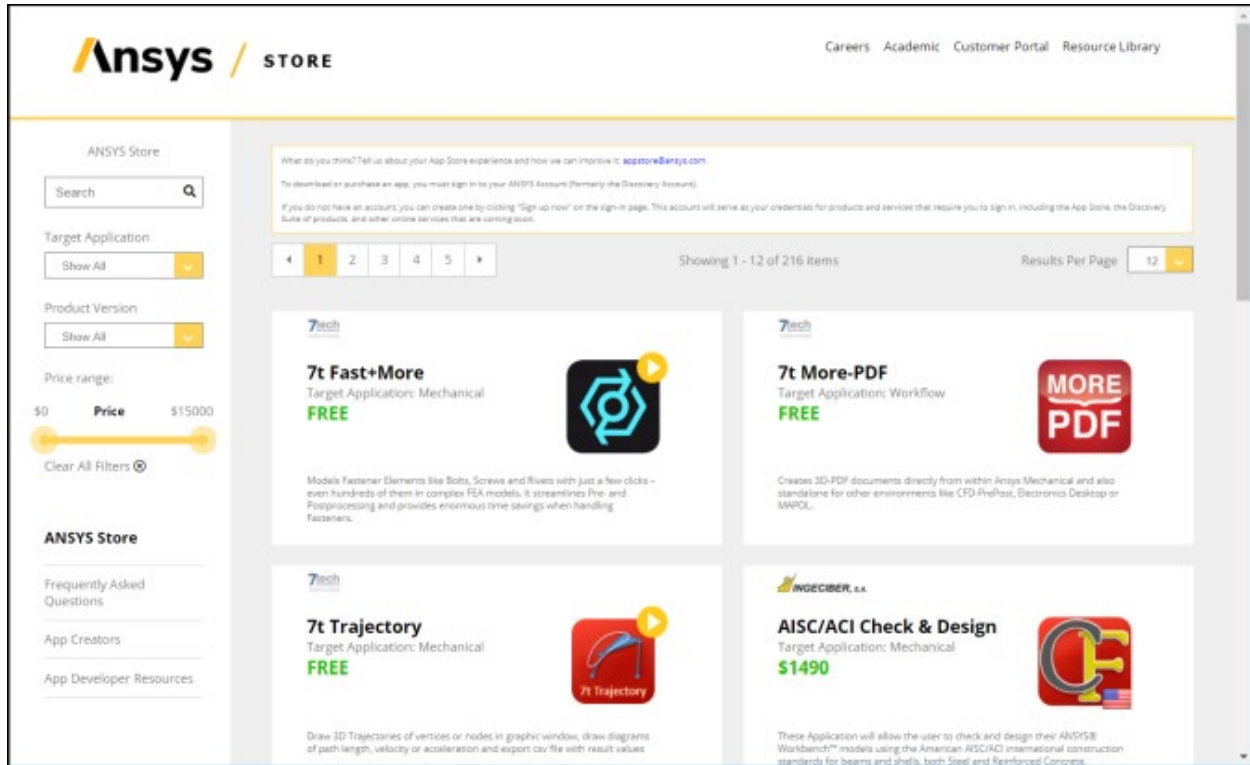
ACT also provides a full set of supporting resources to help you with app development. The ACT documentation includes comprehensive feature overviews and detailed API descriptions. To aid you in development efforts, ACT supplies comprehensive examples for various types of Ansys product customizations, all of which are designed to help you to understand how to use ACT to develop apps. For instance, you can easily modify supplied examples to align them with your own simulation vision, saving you both development time and money. Written and tested on supported Windows and Linux platforms, these examples are packaged for download from the help panel on the **ACT Start Page**. Additionally, on the [App Developer Resources page](#), the **Help & Support** tab displays a link for downloading the examples.

The Ansys training course for ACT covers using ACT and its APIs to customize Workbench, Mechanical/Meshing, and DesignModeler. After completing this course, you will be able to automate the creation of standard tree objects in Mechanical/Meshing, create custom loads and results in Mechanical, create custom objects in DesignModeler, and create wizards in Workbench or its integrated modules.

Where can I find published ACT apps?

The [Ansys Store](#) provides hundreds of free and paid apps developed by Ansys and trusted partners. With more than 6,000 downloads per month, the Ansys Store provides an ever-expanding library of dynamic simulation solutions. These business-specific Ansys apps range greatly in functionality and complexity. You can filter apps based on target application, product version, and price range. Because free apps are available as simple downloads, you can easily use the **Extension Manager** to install and load them to better explore the power that ACT provides. For some free apps, the source code is also included so that you can view and even modify it to create your own custom app.

Getting Started with ACT



In the left pane, you can click the link for the [App Developer Resources page](#), where you will find a multitude of resources for using ACT to develop your own custom apps. On this page, the **Post My ACT Application** tab displays a link for downloading instructions for posting your custom apps on the Ansys Store.

By making complex simulations accessible to all engineers, Ansys apps “democratize” the use of simulation across your organization. With designers being able to perform simulations, expert engineers can spend more time on researching and developing innovative and reliable products.