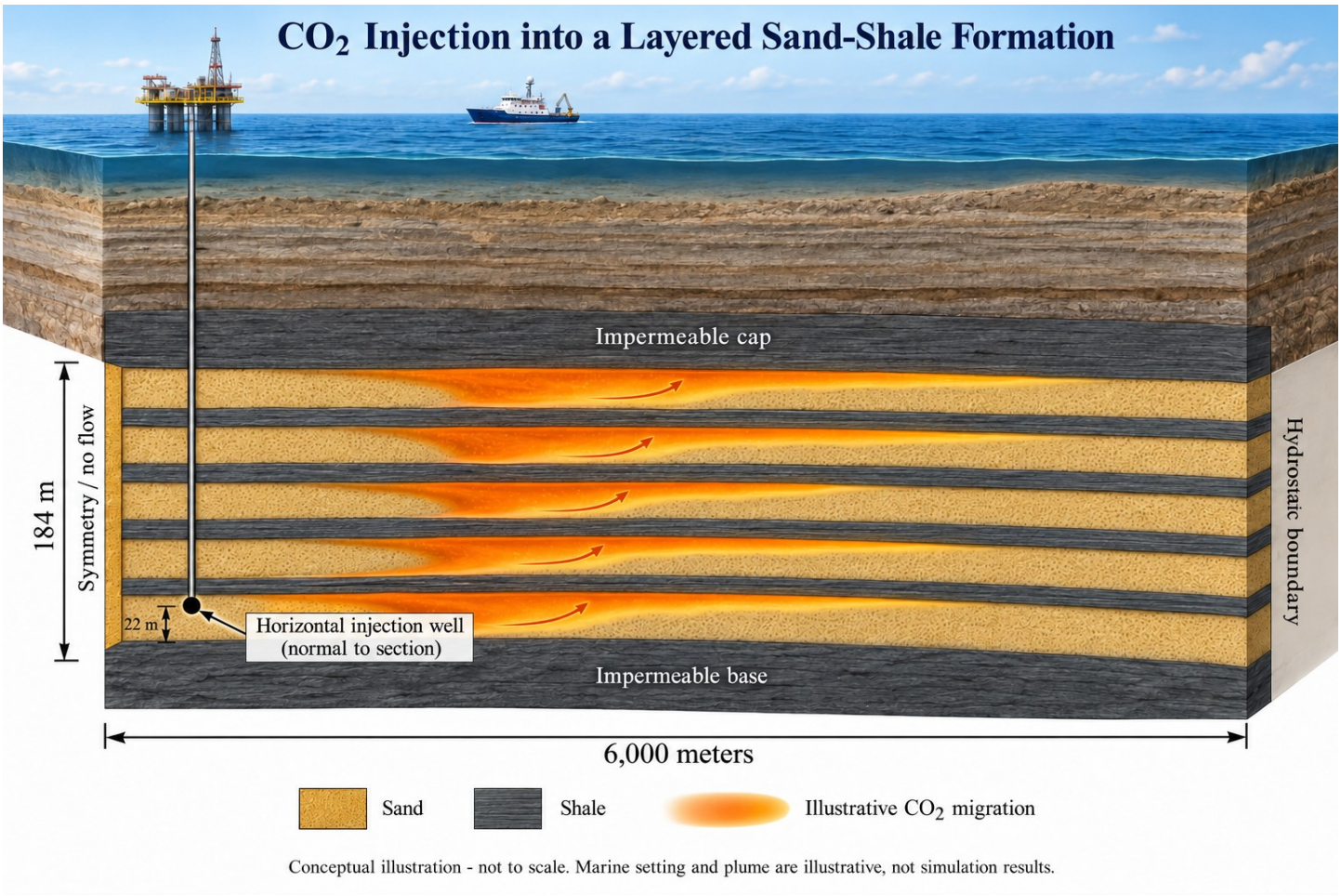
DESKTOP EDITION / November 2026

ModelX User Manual

Installation, setup and operation for TOUGH3 and TOUGHREACT

Windows x64 0.2.0 · Linux x64 0.1.6 · macOS arm64 0.1.6



RTP7 / Layered CO_2 injection

Conceptual model from the ModelX RTP7 engineering report. The offshore setting and plume shapes illustrate the injection scenario.

A PRODUCT OF

TOUGH MODELING GROUP

ABOUT THIS MANUAL

Introduction

ModelX uses large language models (LLMs) to automate the reservoir simulation workflow, from a physical question to a reviewed engineering report. You define the decision the study must support and what evidence would answer it. The Agent uses those criteria to prepare the model, run the simulator and interpret the results.

What you need for an automated study

Bring your own licensed TOUGH3 or TOUGHREACT executable, or source code you are authorized to compile. A compatible customized version of either simulator can also be used. If you start from source, compile it for your platform, then register the executable for the required module in Simulator Management. The Agent also needs access to a supported LLM. In Settings, connect a supported account or model endpoint, use Test connection and select it under Default for new tasks.

From a reservoir question to a result you can inspect

Suppose you need to know how far heat travels from a source and where a gas phase develops. Give the Agent the geometry, rock properties, heating schedule and available observations. In Automatic, it can generate the mesh, assign initial and boundary conditions, write native inputs and audit them before launching the simulator.

During a run, the Management Agent reads the simulator output. If it finds a correctable input problem, it can trace the cause, revise the inputs and repeat the affected checks. Afterward, it compares the saved results with the acceptance criteria and available references. It can choose radial profiles for the heat-source study, explain how far warming and gas enrichment extend, and identify what the saved times leave uncertain. The report stays linked to the inputs and results behind those conclusions.

Where the engineer gains time

ModelX aims to improve engineering productivity by more than 90%, measured as comparable studies delivered per hands-on engineer-hour. Preparing simulator files, diagnosing failed runs, extracting comparable profiles and revising figures all take engineering time. The Agent can carry a correction through these steps and reuse a completed run when only the report changes. To measure the gain, compare manual and ModelX workflows against the same deliverables and acceptance criteria. Include time spent supplying data, resolving questions and reviewing the final work.

Choose how much to delegate

Choose Prepare, simulate and deliver for the full workflow. Start with Create mesh only if you want to inspect the discretization first, or Prepare inputs only to generate or reuse a mesh and review the native files. An existing run can go straight to Results for analysis and reporting. You retain the modeling decisions that need engineering judgment and can inspect each assumption before using a result.

NAVIGATION

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DESKTOP EDITION

Find your starting point

Choose the task that matches the material you already have. The menu screenshots show Windows x64 build 0b5e79604435 of ModelX 0.1.6. Linux and macOS installation details are on pages 9 and 10.

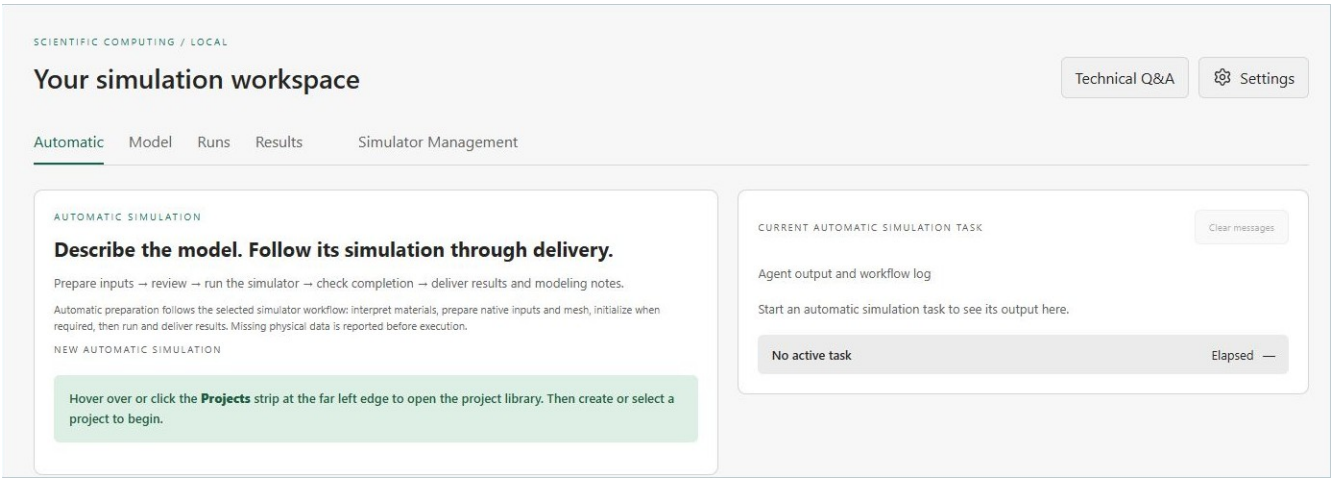


Figure 1. The home view opens with no project selected. Open Projects on the left to begin. Settings and Technical Q&A are available at the upper right.

First installation Read pages 7–25. Choose a workspace and register the simulator before preparing your first task.

Agent managed simulation Read pages 27–47 for the four workflow modes, initial states, mesh handling and recovery.

Manual simulation Read pages 49–56 to import and edit native files, audit the revision and launch a direct run.

Existing results Read pages 57–62 to plot results or produce a report from a completed run. Pages 64–67 cover help and troubleshooting.

Try a small case Page 34 gives a mesh you can check by hand. Pages 68–69 take you from project creation to handover and supply a complete EOS3 training request and its acceptance criteria.

GETTING STARTED

Requirements and installation

Install the workbench and the simulator as separate components. ModelX supplies the desktop interface and its scientific processing tools. Obtain the appropriate licensed simulator distribution and any required databases from your organization or supplier.

Before installation

Computer and storage Choose the Windows x64 distribution, Linux amd64 .deb or internal Apple Silicon .pkg that matches your machine. Use a separate writable workspace with room for native outputs, restart files, figures and reports.

Simulation engine Have an executable for the exact simulator and equation of state (EOS) or module you intend to run. Install the matching runtime dependencies, including a compatible MPI launcher for MPI builds. A source tree and compiler are optional when a working executable is available.

Account and connectivity Have your ModelX / TOUGH2.com sign-in available for execution eligibility. Agent-assisted work also needs a supported connection and permission to share task material. Direct editing and direct simulation do not need an AI connection.

Choose your installation instructions

In the ModelX-0.2.0 delivery folder, choose the installer for your platform. Page 8 covers Windows x64 Setup 0.2.0 (unsigned external trial). Page 9 covers the Linux amd64 Debian package, version 0.1.6. Page 10 covers the macOS arm64 internal test package, also version 0.1.6.

Confirm the installation

1. Open the ModelX About dialog and record the version and build identity. Verify the desktop you opened before registering a solver.
2. Choose a separate workspace in Settings. Save settings, restart, and confirm the workspace path in the project library before importing or creating projects.

Updating an existing workstation

Finish active tasks and save edits. Back up the workspace and retain the previous installer or portable folder for rollback. Use the update supplied for your operating system. After reopening ModelX, confirm the build, workspace and simulator registrations.

GETTING STARTED

Install ModelX 0.2.0 on Windows

Open Windows-x64 in the delivery folder. You need ModelX-Setup-0.2.0.exe and its matching .sha256 file. If upgrading, finish active tasks, back up the workspace and close ModelX.

Verify the download and run Setup

1. Check the SHA-256 Open PowerShell in Windows-x64 and run the command below. Compare the entire Hash value with the first 64 characters in ModelX-Setup-0.2.0.exe.sha256. If they differ, get a fresh copy from TMG.

```
Get-FileHash .\ModelX-Setup-0.2.0.exe -Algorithm SHA256
```

2. Open the installer Double-click the .exe. This trial is unsigned. If SmartScreen appears, confirm the file came from TMG and the checksum matches. Where policy permits, choose More info → Run anyway. On a managed PC, ask IT if installation is blocked.

3. Complete Setup Choose the current-user option if prompted. Keep the suggested application folder or select another installation folder. Click Install, wait for copying to finish, then click Finish. Keep your project workspace in a separate folder.

Launch and check the installation

1. Open ModelX from Start or the new desktop shortcut. In About → About ModelX…, confirm version 0.2.0 and compare the build ID with Windows-x64/READ-ME.txt (it begins 6bb9ff3e8af0). If a different build opens, check the shortcut target.
2. In Settings, select a writable workspace. To reopen existing projects, select their original workspace. Save, restart ModelX and confirm the project list in Projects.
3. To run a model, register your licensed solver in Simulator Management. For Automatic tasks, also configure and test your AI connection in Settings. To remove ModelX, use Windows Settings → Apps → Installed apps.

GETTING STARTED

Install ModelX 0.1.6 on Linux

Use the amd64 Debian package on an x86-64 Ubuntu system with a graphical desktop. The tested configuration was Ubuntu 22.04 under WSL2. In that configuration, run the commands in the Ubuntu terminal.

Verify and install the package

Place the .deb and its matching .sha256 file in the same directory. Open a terminal there and run the two commands in order. Continue when the checksum check reports OK. APT uses the configured Ubuntu repositories to install dependencies, including ParaView and LibreOffice Writer.

```
sha256sum -c modelx_0.1.6_amd64.deb.sha256
```

```
sudo apt install ./modelx_0.1.6_amd64.deb
```

Open the desktop and register a solver

1. Launch ModelX from the applications menu or run /opt/modelx/ModelX from a graphical session. In Settings, choose a writable workspace, for example a ModelX-workspace folder under your Linux home directory. Save and reopen ModelX to confirm the project library.
2. Open Simulator Management, choose the software and module, and register the authorized Linux executable. Under WSL2, select a Linux binary even if the source files are on a Windows drive. For an MPI build, check that the matching Linux MPI launcher and shared libraries are available.
3. Open Runs with an input revision that uses that module. Verify the registered executable and intended parallel mode. A direct run can proceed once the revision and account eligibility checks pass. Configure an AI connection separately for Agent-assisted tasks.

To compile from source on Ubuntu Install the native toolchain with sudo apt install build-essential gfortran cmake libblas-dev liblapack-dev python3. Put a writable copy of your licensed source in the Linux filesystem, then use Simulator Management → Compilation (pages 24–26).

What was verified

The installed desktop generated a four-cell Cartesian grid with four connections and ran native TOUGH3 EOS3 to 1 second. At 0.1, 0.6 and 1.0 seconds, every cell stayed within 1 Pa of 100,000 Pa and within 0.01 °C of 20 °C. Manual Results export produced a Word document and a three-page PDF. In the source-build check, ModelX compiled and registered TOUGH3 1.12 and TOUGHREACT 4.13 EOS3 on Linux x86-64. Both native solvers returned 100,000 Pa and 20 °C in every cell at 1 second. The TOUGHREACT case exercised flow only.

GETTING STARTED

Install ModelX 0.1.6 on macOS

Use the ModelX 0.1.6 internal test package on Apple Silicon. In About This Mac, check for an Apple M-series chip. This package has no Developer ID Installer signature or Apple notarization.

Verify and install the package

Get the .pkg and its matching .sha256 file from TMG. In Terminal, change to the folder containing both files and run the command below. Continue only if the package name is followed by OK. If verification fails, obtain a fresh copy from TMG.

```
shasum -a 256 -c ModelX-0.1.6-macOS-arm64-internal.pkg.sha256
```

Double-click the .pkg in Finder. When Installer opens, choose Continue and Install, then authenticate if prompted. On completion, open Finder → Applications → ModelX.

If macOS cannot verify the developer After trying to open the package, dismiss the alert. If you trust its source and verified its checksum, go to Apple menu → System Settings → Privacy & Security. Under Security, locate the blocked item, click Open Anyway and confirm. Continue in Installer. If macOS reports malware or damage, stop and contact TMG.

On a managed Mac Your employer or university may require IT approval. If Open Anyway is unavailable or policy requires a signed installer, give IT the package name, checksum and alert text. Ask for an approved installation or distribution.

Apple Support · Safely open apps on your Mac

First launch and simulator setup

1. In Settings, choose a writable workspace in your home folder. Save, reopen ModelX and confirm the workspace in Projects.
2. In Simulator Management, register your licensed macOS solver with its module and parallel mode. In Runs, select a matching revision and verify the executable. Use Results after execution. Test the AI connection before starting an Automatic task.

Building from source For a build with the Build method selector, use a writable source folder and follow pages 24–26. Install Xcode Command Line Tools, GNU Fortran (Homebrew gcc), CMake and Python 3. TOUGH3 uses the SDK Accelerate framework.

What was verified

On macOS 15.8.2 arm64, the installed app generated a four-cell mesh, ran externally compiled TOUGH3 1.12 EOS3 (GNU Fortran 13) to 1 s within the tolerances on page 9, and exported Word and a three-page PDF. In-app compilation and registration of TOUGH3 and TOUGHREACT still await native Mac verification.

COMMAND REFERENCE

Menus and workbench navigation

File and Edit act on the desktop window. The row inside the workbench switches between engineering activities. On macOS the application menus appear in the system menu bar. Choose File → Close project with Command+W on macOS or Ctrl+W on Windows and Linux.



Figure 2. File, Edit and About sit directly below the window title. Project navigation and engineering activities appear inside the workbench.

Desktop menus and Windows shortcut examples

File → Close project **Ctrl+W** Returns to the home view. The project and background work stay available. Save or discard pending edits if the close action is blocked.

File → Exit Closes the application. Finish or deliberately stop active work before exiting for maintenance.

Edit → Undo / Redo **Ctrl+Z / Ctrl+Y** Reverses or reapplies edits in the focused editable field. These commands act on text and do not restore a deleted revision or undo a simulation.

Edit → Cut / Copy / Paste Ctrl+X removes the selected editable text to the clipboard. Ctrl+C copies the selection. Ctrl+V inserts clipboard text at the caret. In fixed-column files, check spacing after pasting.

Edit → Delete / Select All Delete removes the selected editable text. Ctrl+A selects the contents of the focused control. Right-click on text for the available Cut, Copy, Paste and Select all commands.

About → ModelX version / About ModelX… The version row identifies the release. Open About ModelX… to check the running build against the ID supplied with your installer.

Workbench commands

Projects / Automatic / Model Projects opens the library. Automatic creates or continues a task. Model manages native files and their saved revisions.

Runs / Results Runs audits and executes a selected revision and displays logs. Results selects a revision with output and creates or opens figures, histories and documents.

Simulator Management / Settings / Technical Q&A Manage installed engines and sources in Simulator Management. Open Settings for the workspace, account, AI and support. Technical Q&A answers a question about the selected software.

DATA MANAGEMENT

Projects and input revisions

A project groups the model materials, input revisions, simulations and outputs for one study. A revision identifies an exact set of native input bytes. A run records what happened when a particular revision was executed.

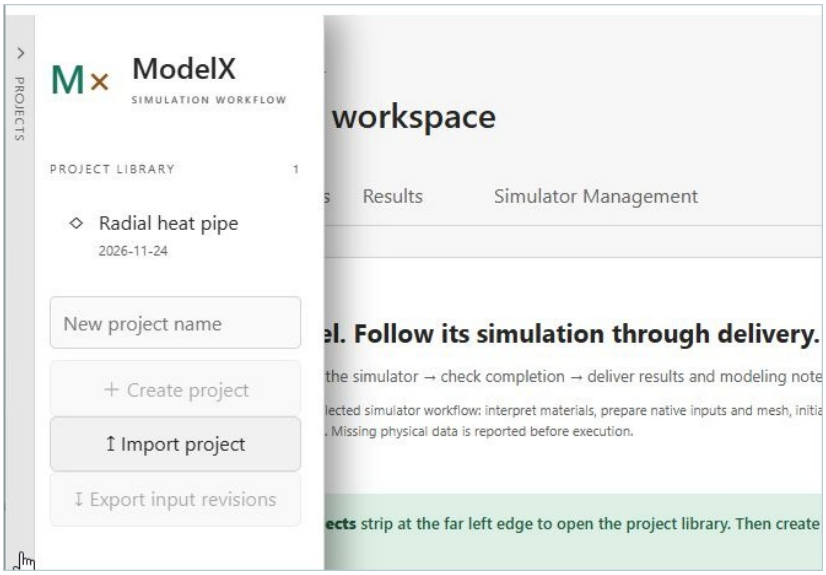


Figure 3. The Projects drawer lists projects in the current workspace. Create and import appear below the list. Export becomes available after selecting a project.

1. Hover over or click Projects on the far left. Enter a descriptive project name and choose Create project, or click an existing project. Check its name above the navigation row.
2. Choose Import project to open a ModelX project input-revision bundle (.modelx.json). Use Model → Import input files for native files such as INFILE and MESH.
3. Select a project and choose Export input revisions to transfer its saved inputs. For a full backup that includes runs, reports and figures, close the application and back up the workspace directory, including its shared indexes.
4. Use the revision selector in Model and Runs. Use Results input revision to select the outputs associated with a run. A new input revision needs its own execution before it has computed results.

Right-click a project for Delete project…. Delete revision acts on the selected input revision. Inspect the confirmation and any dependencies first. These commands remove owned files and records. To leave a project without removing data, use File → Close project.

DATA MANAGEMENT

Move a study and recover the right revision

Choose what the recipient needs before moving files. An input-revision export supports reproduction of a deck. An engineering handover often also needs the original references, job outputs and delivered reports.

Starting a study Open Projects, enter a descriptive name, and select Create project. Use a name that identifies the site or benchmark. Within the project use task names that convey purpose, such as “RHP baseline”, “RHP source sensitivity” and “RHP report revision”.

Sharing only prepared inputs Select the project, choose Export input revisions and retain the .modelx.json bundle. At the destination use Import project. Open Model and inspect the revision list and native filenames. Check local runtime registration separately before running imported inputs.

Preserving completed results Finish active work and close ModelX before copying the workspace. Copy the entire workspace, including its indexes and projects directory. Keep the original until the copied workspace opens and its existing jobs, figures and delivery folders can be inspected. Use a separate copy when trying a restore.

Selecting the right evidence Write down the project, revision, task or job ID, end time and build at handover. In Runs select that revision and locate the job. In Results confirm that its variables and saved times agree. Similar project or revision names alone cannot establish the identity of a run.

Deleting versus closing Use File → Close project to leave the study. Delete revision and Delete project remove owned records and files. Before confirming, identify any needed original run, restart, report and source material and verify your backup. For experiments, create a new revision and retain the baseline.

A quick restore test

Select the copied workspace in Settings, save and restart. Open one known project and read an existing input. Find a recorded job and open its working folder, then open its published report or figure. A visible project name alone verifies only the index.

SETUP

First use and workspace setup

Open Settings from the upper right. On a fresh installation the Getting started checklist can open automatically. Its statuses show which components have been configured. A live connection test and a successful run are separate checks.

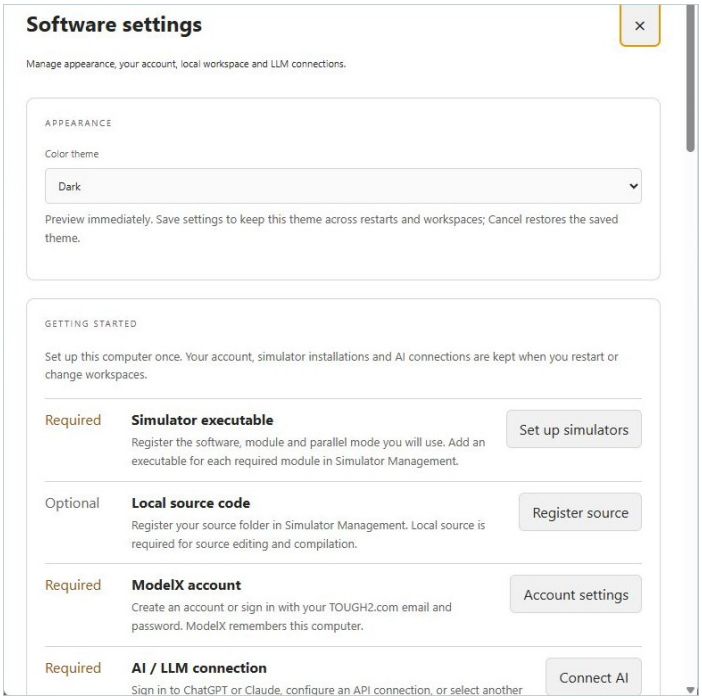


Figure 4. Getting started links directly to simulator registration, optional sources, the ModelX account and the AI connection.

Appearance Choose Light or Dark. The preview changes immediately. Save settings retains the theme. Cancel restores the saved preference.

Getting started Set up simulators opens executable registration. Register source opens the simulator source area. Account settings and Connect AI scroll to their respective setup panels.

Local workspace Scroll to Local workspace. Type a path or select Browse workspace folder…. Save settings and restart. Selecting a different folder opens a different project library. Existing projects remain in their original folder.

What persists The application retains account connections, simulator installations and settings across workspace changes. Each workspace owns its project folders, revisions, runs and reports. Keep the workspace outside the application installation.

Confirm first-use setup Reopen the workbench. Check the workspace path in Projects, the signed-in account in User management and the executable for your chosen module in Simulator Management. For Automatic, also test the default AI connection and confirm material sharing.

SETUP

Account and execution allowance

The ModelX / TOUGH2.com account identifies the user for simulation eligibility. Configure this separately from the AI provider account used to answer questions or prepare a task.

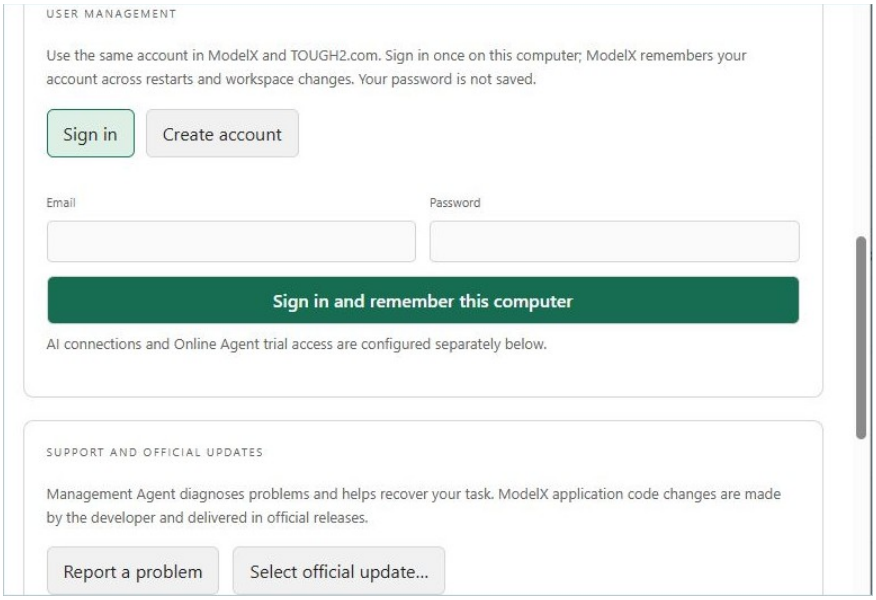


Figure 5. User management is available from the checklist. Use Sign in for an existing account or Create account for registration.

1. Open Settings → User management. For an existing account select Sign in, enter the TOUGH2.com email and password, and select Sign in and remember this computer.
2. For a new account choose Create account. Complete the displayed identity and organization fields, email, password and email verification step as prompted. Check the signed-in name and account type when finished.
3. Check that Email identifies the account you want to upgrade. Choose Sign out on this computer to switch accounts.

How the cell count is used

Registered users can run up to 3,000 total mesh cells, including boundary and inactive cells. For a larger model, email TOUGH MODELING GROUP (TMG) to request a Paid User upgrade. Include your TOUGH2.com account email and the total cell count you need.

Email TMG at keni@tough2.com

After TMG confirms the upgrade, open Settings → User management and select Refresh account. Check Account type for paid and Last received mesh allowance for the new cell count or Unlimited. ModelX verifies the allowance again before starting each simulation. If higher access cannot be verified, the 3,000-cell limit applies. Over-limit inputs and completed results remain available.

SETUP

AI connections and sharing

Settings → AI model settings controls which connection new tasks use and which task materials may be sent to it. A saved login, a successful connection test and permission to share are three separate settings.

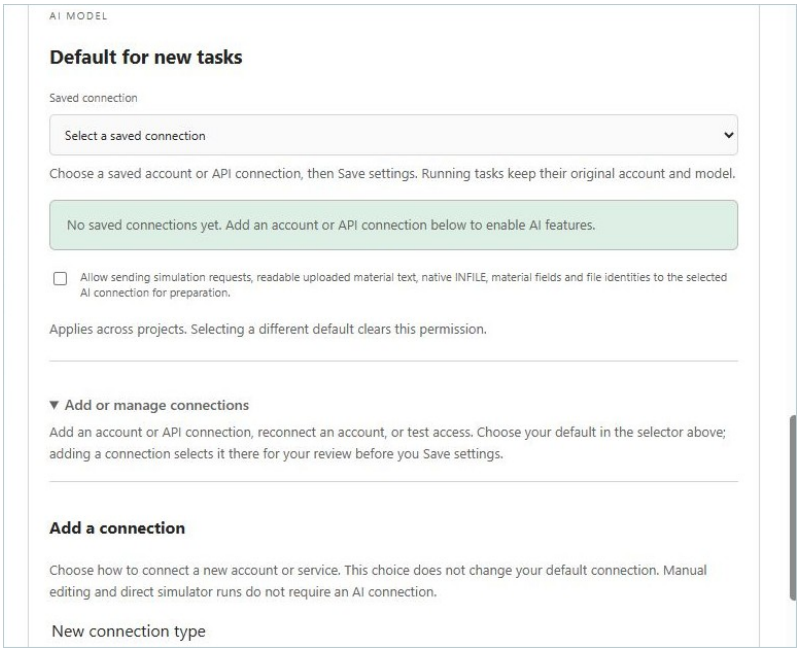


Figure 6. Set the default above the sharing control. Expand Add or manage connections to register or test a connection.

ChatGPT account / Claude account Choose the account type, open Installation instructions if a required client is missing, then start the sign-in flow. Complete authorization in the provider's browser, return to ModelX and test the saved connection. Each connection uses its own account context.

OpenAI API / Other API or local service Select a service, enter its Responses-compatible base address without the /responses suffix, the exact model ID and the credential requested by the form. The selected endpoint and model must support the tools needed by the task. A native Messages-only endpoint requires a compatible gateway for this connection type.

Online Agent (trial) Use the signed-in ModelX account or the separate website-session option shown. Connect and test the service. Availability follows the connected service.

1. Under Check a saved connection, choose it and click Test connection. Then select it under Default for new tasks. For supported OpenAI connections, Processing speed offers Standard or Fast. Fast can incur higher provider charges.
2. Review the checkbox for sending requests, readable materials, native input, material fields and file identities. Enable it only for a connection authorized for the project, then Save settings. Changing the default clears this permission. Running tasks retain their captured account and model.

SETUP

Choose an AI connection

Open Settings → Connect AI in the Getting started checklist, or scroll to AI MODEL. Expand Add or manage connections. Select the route according to the credentials and service you actually have.

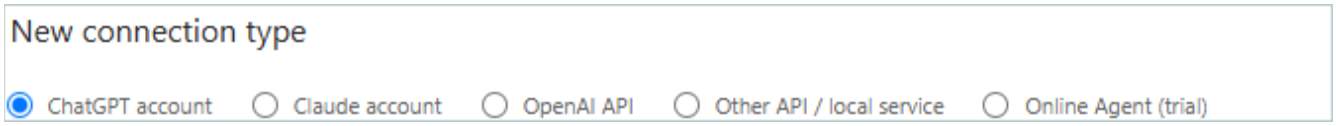


Figure 7. The five connection routes in the desktop application. Choose the route before entering credentials.

ChatGPT account Use a ChatGPT account with Codex access and a working local Codex runtime. Sign in through the official browser flow. The account route uses the connected runtime's model selection. The form does not ask for an API model ID.

Claude account Use Claude Code and an eligible Claude account. ModelX starts the official login flow. Use this route when your organization authorizes Claude Code account access. In version 0.1.6, Claude tasks that execute local commands through ModelX require Windows. Check your intended workflow when choosing this route on Linux or macOS.

OpenAI API Use a key for a billed OpenAI API project and an exact accessible model ID. This is the route for explicitly selecting a GPT model by its API identifier.

Other API / local service The service selector offers Alibaba Cloud Bailian (Qwen / DeepSeek / GLM), Claude through a Responses-compatible gateway, and Other / local Responses-compatible service. Actual model availability follows the selected endpoint, region and account. For Agent work the endpoint and model must support Responses and tool calls.

Online Agent (trial) Use an eligible TOUGH2.com account or approved website session. The trial service supplies the model connection. Simulator execution remains local.

Adding a route does not install model weights or register a simulator. The software/module selector in Automatic controls the physics engine. The saved AI connection controls which service assists with preparation and review.

SETUP

Connect a ChatGPT or Claude account

Choose an account-based connection when you have the appropriate provider account and its local runtime. Have your organization's intended browser account available before starting.

ChatGPT account

1. In Add a connection select ChatGPT account. Use Installation instructions if the local Codex runtime is missing. Complete the official installation for your operating system and reopen ModelX if the newly installed runtime is not detected.
2. Click Add ChatGPT account. ModelX creates a separate login environment and opens the provider's sign-in page. Check which account the browser suggests, complete authorization and return to the application. Cancel sign-in ends a pending ModelX sign-in.
3. Inspect the saved account row. Select the account under Connection to test and click Test connection. Expect Model response received. If an older saved login displays reconnect required, choose Sign in again and verify the account shown.
4. Choose Use as default or select the account under Default for new tasks. Review the material-sharing checkbox and Save settings. With multiple accounts, repeat Add ChatGPT account for each one and verify the email or profile of the chosen default. Removing an account removes that saved choice.

Claude account

1. Select Claude account. Click Installation instructions to open the official Claude Code setup guide. Once installed, click Sign in with Claude. If an official terminal opens, leave it open while completing the browser authorization.
2. If the provider displays a code, paste it into the official Claude Code terminal. Return to ModelX, test the saved Claude connection, select it as the default, review sharing and save. Stop waiting ends ModelX's wait. Close the login terminal as well if you intend to abandon the provider login.

Browser sign-in alone does not register either account in ModelX. If the short connection test succeeds but preparation fails, check material sharing and run the small input-only qualification described later in this chapter.

SETUP

Add an OpenAI API model

This path lets you specify a model explicitly. A working example of a provider-published identifier is gpt-5.4. Use it only if the API project you choose grants access. Different projects may expose different models.

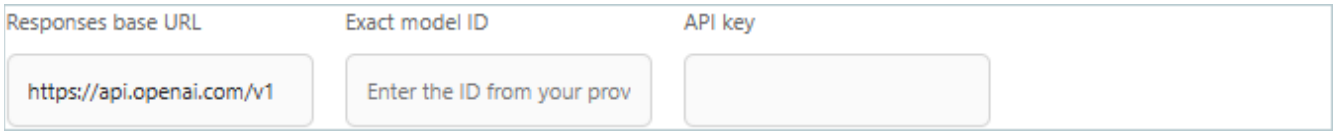


Figure 8. OpenAI API fields. The base URL is prefilled. The model identifier and API key come from your API project.

1. Select OpenAI API in Add a connection. Use Installation instructions for the required local Codex runtime. Use Open API key page to create or obtain a key for the intended API project. Check that this project has API billing and model access.
2. Set Responses base URL to https://api.openai.com/v1. In Exact model ID enter gpt-5.4, or copy an enabled ID directly from the project's model catalog. Preserve punctuation. A display name such as "GPT 5.4" is not the API identifier.
3. Paste the key in API key. Click Add connection. ModelX clears the key field and lists the saved connection. Keys are stored with operating-system encryption outside project exports. Enter credentials only in their dedicated field.
4. In Check a saved connection, select the new entry and click Test connection. Verify Model response received. Then select it under Default for new tasks, choose Standard or Fast if offered, review material sharing and Save settings. Fast changes the requested service tier and may cost more.

Add a second model Repeat Add a connection with the desired model ID and a key authorized for it. Test the new entry individually. Select the intended default before starting a new task. A current task continues with its captured connection.

Provider reference for the example ID and its supported interfaces

SETUP

Add Qwen DeepSeek GLM or a gateway model

Choose Other API / local service. The Model service selector supplies guidance for each route. It does not automatically enable all the model families printed in the selector.

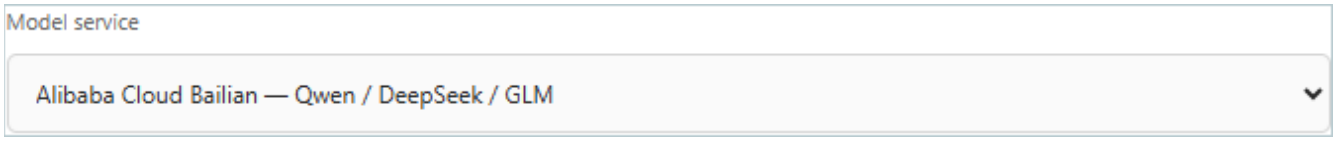


Figure 9. Model service appears after selecting Other API / local service. Changing the service clears its model and key fields.

Alibaba Cloud Bailian

1. Choose Alibaba Cloud Bailian — Qwen / DeepSeek / GLM. Open Provider setup instructions. In your Model Studio workspace select the deployment or model you can use, then find the Responses API base address and key for that same workspace and region.
2. Paste the base address without the terminal /responses. Copy the exact ID of a model enabled for Responses and tool calling. For example, a Qwen deployment may have a different ID from its display name. The URL placeholder contains YOUR_WORKSPACE and must be replaced with the actual workspace address.
3. Enter that workspace's API key, choose Add connection, then test the saved entry. For DeepSeek or GLM, verify that the specific deployment exposes the required interface. Availability through a chat or web playground by itself is insufficient.

Claude gateway or a local service

Claude gateway Choose Claude — Responses-compatible gateway. Obtain the gateway's HTTPS base URL, its model alias for Claude and its credential from the operator. The native Anthropic Messages endpoint speaks a different protocol. For direct account login use Claude account instead.

Other or local Start the model server and load the desired model. Obtain its active port, base path, served ID and accepted key. For example, a server configured at port 8000 with a /v1 base would use http://127.0.0.1:8000/v1. Enter the actual configuration. ModelX allows loopback HTTP and requires a nonempty credential in this form. Remote services use HTTPS.

Model Studio Responses API guide

SETUP

Enable the trial or qualify a new connection

A successful sign-in, a successful text request and a successful engineering task each verify something different. Use an innocuous training project for the checks below.

Online Agent trial Select Online Agent (trial) → Connect using signed-in ModelX account. Trial eligibility is checked by TOUGH2.com. If you are using a separate approved session, expand Use a separate website session instead, paste the signed-in website workspace address into the dedicated field and click Connect and test cloud service. The address contains session information. Keep it out of reports and project prompts.

Text check Select the saved connection under Connection to test. Test connection sends a short ModelX question without files or tool use. Look for Model response received. Cancel test stops an outstanding test. Testing an entry here leaves your saved default unchanged.

Engineering check Select the tested entry under Default for new tasks. Review permission for sharing simulation requests, readable material text, native input, material fields and file identities. The checkbox applies across projects and clears when you change the default. Choose Save settings. Create a small input-only task using nonsensitive data. Verify the native files, audit and achieved task status.

If the connection fails

Unauthorized or forbidden Recheck the account, token or key, API project, entitlement and region. For an account profile use the provider sign-in again. For an API entry correct the credentials in a new connection and test that entry.

Unknown model or missing route Check spelling, deployment alias and whether the URL ends in /responses or /chat/completions. Use the service's published Responses base and enabled model ID. If only Chat Completions is exposed, use a compatible gateway or another supported route.

Text works but tools fail Check whether the deployment and gateway support tool calls end to end. Check the default and sharing checkbox again. Keep the failed task's diagnostic. A model's ability to answer a short question says little about native file preparation or scientific quality.

SETUP

Register simulators and sources

Open Simulator Management → Executables and source registration. Register the software once, then select the simulator and module for each task in Automatic or use the module associated with a saved input revision in Runs.

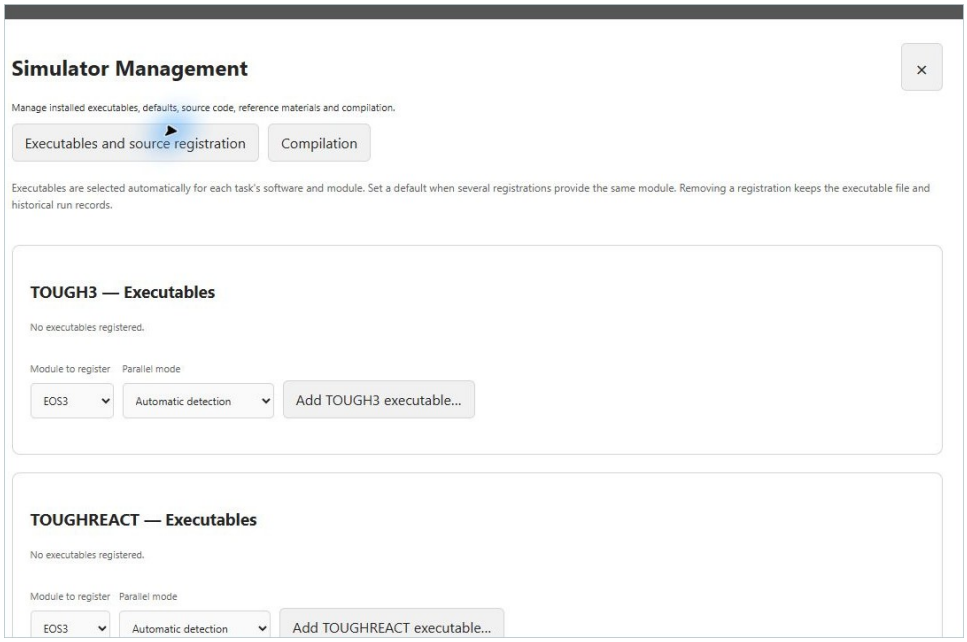


Figure 10. TOUGH3 and TOUGHREACT have separate registration rows. Set Module to register and Parallel mode before choosing the executable.

1. In the correct software section select Module to register. Choose Automatic detection or specify Serial, MPI, OpenMP or Hybrid (MPI + OpenMP) to match the actual binary. Select Add TOUGH3 executable… or Add TOUGHREACT executable… and browse to the installed program.
2. Review the executable location, module and parallel mode in the table. When several binaries serve one software/module pair, choose its Default radio button. With a single matching executable the default is automatic. Use Save simulator settings.
3. Under Source code and reference materials, use Add / change source folder… for an authorized local source tree. Add reference materials… registers manuals and technical material with the selected software. Attach case-specific documents to the project or task.

Remove unregisters a binary. Remove source location disconnects a source path. The original external files remain at their locations. CPU counts belong to run controls. If Runs cannot find a matching executable, check the software, EOS and registration before changing the inputs.

SETUP

Register an engine and verify the selection

Use this example for a TOUGH3 EOS3 installation. Apply the same steps in the TOUGHREACT section when registering a reactive engine. The model and module must match the executable supplied to you.

1. From the workbench open Simulator Management → Executables and source registration. In TOUGH3 — Executables, select EOS3 under Module to register. Set Parallel mode using the distributor's information, or choose Automatic detection and review the detected result.
2. Click Add TOUGH3 executable… and browse to the actual simulator binary. Select the row for that installation and check module, executable path and parallel mode. An MPI launcher is a supporting program. The simulator registration should identify the simulator itself.
3. If several EOS3 binaries are registered, select the intended Default. Save simulator settings. Open Automatic in a training project and set Model to TOUGH3 and Module to EOS3. Verify which executable ModelX selects. In Runs, a saved EOS3 revision should resolve to the same intended installation.
4. Add manuals under the simulator's reference materials. Put the study's field measurements, geometry and benchmark figures in the task materials so that the Agent can distinguish general reference information from the current case.

If the wrong engine appears First check the task's software and module, then check the default for that pair. If a binary moved, register its new path and validate it before removing the obsolete registration. A new default applies to future execution. The historical job record identifies the binary used previously.

If a build cannot launch Open the terminal output. Check that the executable exists and that any required runtime libraries, MPI launcher and environment match the installed build. A launch failure before the simulator reads its deck is a different problem from a rejected native input.

SETUP

Optional source editing and compilation

Use Simulator Management → Compilation when you maintain an authorized simulator source tree. If a suitable binary is already installed, proceed directly to Automatic or Runs.

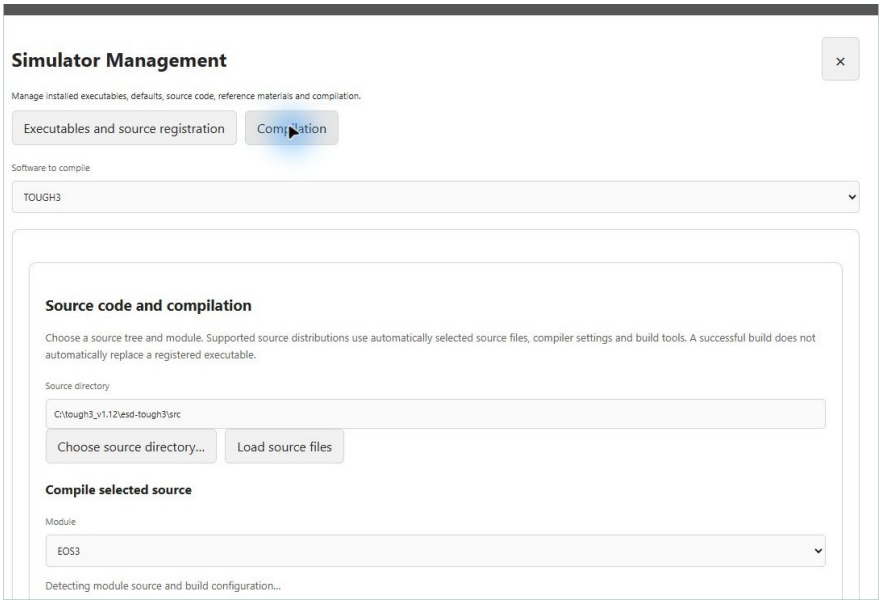


Figure 11. Select the software and source directory first. The available build fields depend on the source distribution and selected module.

1. Select Software to compile. Confirm the Source directory, choose the folder if necessary and click Load source files. Find source file filters the available files. Select the intended file before editing.
2. Use Save source to write an intended source change, or Discard edits to abandon it. Keep a separate version-controlled or backed-up copy. Resolve unsaved changes before switching files, closing the editor or compiling.
3. Under Compile selected source, choose the Module. Set Build method to Automatic module build for a recognized source tree. Read the detected configuration. Page 25 explains the toolchains and optional capacities. If your installation lacks Build method, it predates this feature.
4. Choose Start compilation and read Compilation output. Use Stop compilation if necessary. After success, choose Register compiled executable. ModelX checks that the file still matches the recorded SHA-256 digest. For a different source layout, follow Custom build command on page 26.

After a successful build, locate the resulting executable. Register it for the correct software, module and parallel mode, choose the intended default and verify it on an appropriate known case before using it for project decisions.

SETUP

Build a simulator from an authorized source tree

The Compilation tab is for users who maintain simulator source. Users with an installed binary can go directly to registration. Keep a copy of the source and the vendor build instructions before editing.

Windows toolchain Install Intel Fortran Classic (ifort) with the oneAPI environment and Visual Studio 2022 build tools including NMake. Make cmake.exe (TOUGH3) or python.exe (TOUGHREACT) available on the PATH inherited by ModelX. Restart ModelX after changing PATH.

Linux and macOS toolchains Use GNU Fortran, make and Python 3. TOUGH3 also needs CMake and BLAS/LAPACK. On Ubuntu install the development libraries; on macOS install the Command Line Tools with the Apple SDK and Accelerate. Page 9 covers Ubuntu and page 10 covers the Mac.

1. For TOUGH3, select the distribution containing esd-tough3 and its sibling esd-toughlib, or select esd-tough3. The automatic plan builds a serial Release executable for the selected EOS. Use Custom build command for a vendor MPI build.
2. For TOUGHREACT, select the v4.13 project or Toughreact_v413src. The recognized layout includes build.py, configure_build.py, the requested EOS Fortran source and its make target. Linux and macOS use makefile_v4_gfortran. Windows uses nmakefile_v4_windows. The recipe builds an OpenMP executable with bounds checks.
3. Review the detected plan and start compilation. Each automatic build gets a fresh output directory. Read Compilation output for the first compiler or linker error. On success, ModelX checks for the expected executable and records its path and SHA-256 digest.

Size the TOUGHREACT binary Leave Elements and Connections blank to inherit the source defaults, or enter capacities large enough for your study. The EOS3 build check used 256 elements and 1,024 connections for its four-cell case. These are compile-time array sizes and affect memory use. Your authenticated mesh allowance still governs execution.

Register and check the binary In Simulator Management, open Executables and source registration. Add the executable under the correct simulator, module and parallel mode, choose the intended default and save. Run a small known case and compare its physical response with the reference before using the binary for engineering decisions.

SETUP

Build a customized source distribution

Use this route when the automatic plan cannot recognize a source layout or when the supplier specifies a different compiler, MPI configuration or build script. Use the build instructions that accompany your source.

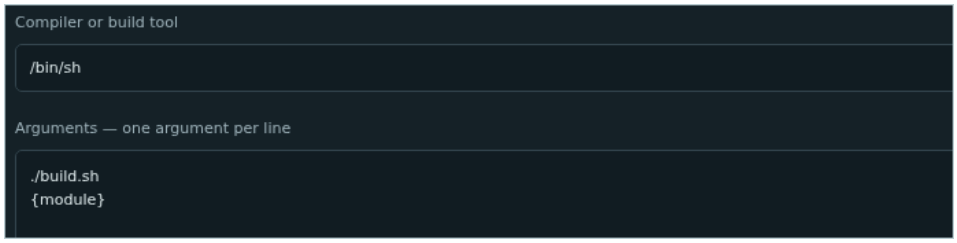


Figure 12. Linux Compilation tab with the shell and the two argument lines for the example below.

1. Open Simulator Management → Compilation. Select Software to compile, choose the Source directory, then choose the target Module. Under Build method, select Custom build command. This also works when automatic detection displays an error.

Example with a supplier script Suppose your Linux or macOS source directory contains build.sh and its documented first argument is the uppercase EOS name. Enter /bin/sh under Compiler or build tool. In Arguments, enter the two lines shown below, each without surrounding quotes. ModelX replaces {module} with the selected name, for example EOS3. Adapt the argument order and spelling to your own script.

```
./build.sh
{module}
```

Example with CMake For a CMake project, run the configure and build steps separately. Select CMake: configure and enter the source, build directory and module flags specified by the supplier. After it succeeds, select CMake: compile, check that its build directory matches, and run Start compilation again. Register the solver after the compile step produces it.

Working directory and logs The command runs in the chosen source directory. Put each argument on its own line, including paths with spaces. Use an absolute tool path if the desktop cannot find the command. If the script writes diagnostics to a file under the source tree, put its relative path in Compiler output log. Read Compilation output or use Stop compilation to interrupt the build.

Register the intended output Choose Select and register executable… and select the native solver created by this build. In Executables and source registration, check its path, module and parallel mode. Set the intended default if more than one binary serves that module. In Runs, select a matching input revision and compare a small known case with its expected result.

AUTOMATIC SIMULATION

Choose an automatic workflow

Select a project and open Automatic. Give the task a distinct name, select Model and Module, and check the automatically selected executable. Workflow mode determines which files ModelX prepares and whether a simulator job is allowed.

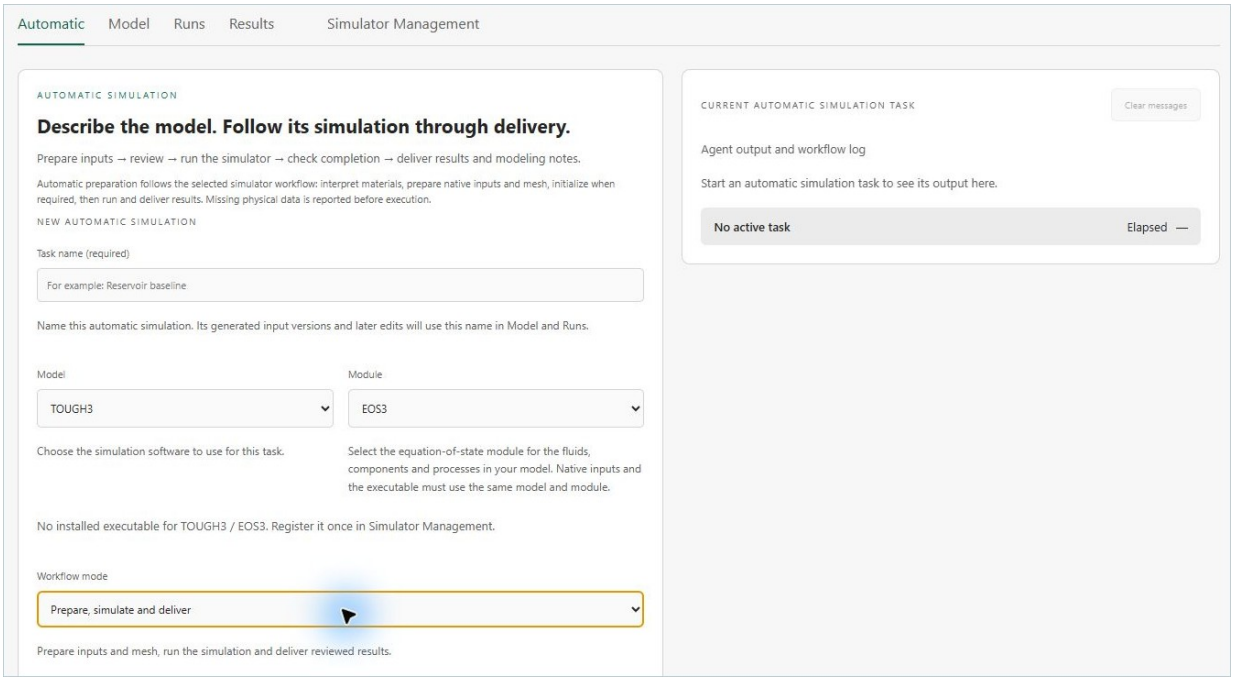


Figure 13. A new task starts at the left. The current task status, messages and later delivery controls appear at the right.

Prepare, simulate and deliver Prepare native inputs, initialize if required, execute, review native results and produce the engineering delivery. Use this for a new simulation objective.

Prepare inputs only Prepare the complete simulator input set. This includes mesh generation when needed and can reuse a selected mesh. The task ends at Inputs ready. Inspect the revision in Model before deciding whether to run it.

Continue an existing simulation Select an eligible stopped task and the work to redo. Full rerun, postprocessing and report-only options have different execution consequences. See page 45.

Create mesh only Generate and audit a native computational mesh and its associated geometry and generation records. This prepares a mesh revision for reuse. It does not prepare a complete flow/chemistry deck or launch a simulation.

An unavailable continuation means there is no eligible source in the current context. A disabled model or module is unavailable in that build. Choose the software and EOS that represent the requested physics.

Available simulation codes TOUGH3 and TOUGHREACT are the integrated choices in this edition. TOUGH4 and TOUGH+HYDRATE are reserved entries where displayed. Choose an enabled software and module with a matching registered runtime.

SIMULATOR SETUP

Choose an EOS and describe multiple continua

Choose a simulator and equation-of-state module that match the fluid system, components and phases in your study. Check the registered executable before asking the Agent to prepare a run.

TOUGH3 module selector The catalog lists EOS1, EOS2, EOS3, EOS4, EOS5, EOS7, EOS7R, EOS7C, EOS7CA, EOS7MG, EOS8, EOS9, ECO2N, ECO2M, ECO2NV2, TMVOC and EWASG. In Simulator Management, check which executable and parallel mode are registered for the particular module you need.

TOUGHREACT module selector The catalog lists EOS1, EOS1SC, EOS2, EOS3, EOS4, EOS5, EOS7, EOS8, EOS9, ECO2N and EWASG. Match the flow module to the executable and retain the reference chemistry inputs, database identity and coupling choices that apply to the study.

Request a fracture–matrix continuum pair For a mesh-only extension of a retained physical grid, describe which rocks have paired fracture and matrix continua and which stay single. Supply the original native reference mesh with its material identities and exchange connections, plus the physical base grid and orientation evidence. The Automatic mesh Agent uses the matched reference records to partition volumes and determine exchange geometry. A planar fracture drawn as a thin material region represents a different modeling choice.

Read the separate checks Inspect the shared-face audit for spatial connections. For co-located fracture–matrix elements, inspect the native volume split and the exchange distances and area. Check any source-defined lumped links separately. Review approximations for removed cells or remapped features. Before a later simulation, verify initial conditions, physics and forcing for the resulting element identities.

AUTOMATIC SIMULATION

Specify the model and prepare inputs

Give the Agent enough physical information to decide what the native inputs must represent. A task name identifies the work. The Model request describes the engineering problem, evidence and acceptance criteria.

Fill in the request

1. Name the task and attach the model description, relevant manual pages, drawings, tables and benchmark evidence using Upload model materials. Give sources interpretable names. Keep units and coordinate conventions with each table.
2. Specify geometry and extent, material regions, fluid components and phases, constitutive relations, starting state, boundary conditions, sources/sinks, run duration and desired observations. Identify which supplied values must be preserved and which choices the Agent may make.
3. Import a native MESH or supported external grid if it defines the case. Review conversion units, default rock, region mappings and planar thickness. Provide compatible initial conditions where the case requires them. For TOUGHREACT, check flow, transport, chemistry and thermodynamic database provenance together.
4. Use a numerical acceptance statement. Name the locations, variables, saved times, comparison basis and tolerances. Ask the Agent to label assumptions and distinguish completion, physical plausibility and benchmark agreement.

Example request for an input-only task

> “Prepare the native inputs for the supplied EOS3 radial heat-pipe model. Reuse the accepted project mesh. Preserve the heat source, initial state and closed boundaries in the supplied description. Check the source element, material names and cell count. Deliver the inputs and identify any assumed parameters. Stop after input preparation.”

What to inspect before execution

Open the published revision in Model. Check INFILE (flow controls), MESH (cells/connections), GENER (sources) and INCON where applicable. A deck can legitimately carry default initial conditions internally. For reactive models, expect the adapter’s native names such as flow.inp, solute.inp and chemical.inp. Check the audit, material links, assumptions and actual files required by that case.

Start a full workflow

Choose Prepare, simulate and deliver, set the initial state and select Start task. For the radial heat pipe, ask the Agent to reach the end time in the supplied description, compare the warming radius and gas-saturation front at matching saved times, and deliver the plots, comparison and remaining qualifications.

AUTOMATIC SIMULATION

Write an automatic task that can be checked

Start in Automatic with a project selected. A useful request gives the Agent both the problem and the evidence that will decide whether it succeeded. Separate physical inputs from choices the Agent may make.

Task name and mode Give the work a unique name, for example “RHP EOS3 baseline”. Use Prepare, simulate and deliver for a new calculation. Select the physical simulator and EOS, then confirm the corresponding executable. Choose the initial-state route described by your source.

Model materials Upload the problem description and the evidence you want used after the run. Include the specific manual figure, measurement table or baseline with units, time convention and location. Name which source controls if two documents disagree. Explain any columns or element identifiers that cannot be interpreted from a heading.

Model request State geometry and active dimensions, material regions, thermophysical properties, initial phase state, boundaries, injection or heating schedule, duration, desired saved times and comparisons. Distinguish a cell-center observation from a boundary value. If a value is unknown, say which sources to search and whether an engineering estimate is acceptable.

Example of a comparison instruction

> “Use the attached radial heat-pipe description for the source rate and initial state. Preserve the accepted radial mesh. At the reference times, compare temperature and gas saturation at matching cell centers. Report the warming radius using a 1 °C increase from the initial state. Report the threshold, units, matched times, and any missing data. Deliver one profile per variable and the native evidence.”

Before Start task Check task name, module, intended scope and uploaded materials one last time. If comparison tolerances come from a specification, give their actual values. If the reference is a plotted curve with no numerical values, ask for a qualified visual comparison or a documented digitization method.

Expected evidence After preparation, look for native inputs and assumptions. After execution, look for the job and achieved horizon. After review, inspect the figure sources, comparison basis and qualifications before accepting the report.

AUTOMATIC SIMULATION

Set up a reactive or multistage task

For TOUGHREACT, flow, transport and chemistry share a mesh and must describe the same physical system. Use the reactive controls that appear after selecting TOUGHREACT and the appropriate module.

Flow and transport Identify the flow deck, material names, sources and element naming scheme. State the transported species, output quantities, time convention and active coupling processes. Copy any benchmark-specific flags from the governing source into the requirements with their provenance. Extra output alone does not justify enabling a new process.

Chemistry and database Provide the chemical definition and intended initial and boundary waters. Use Choose thermodynamic database for the supplied database. Its original filename must agree with the reference in solute.inp. Check species order, database identity, concentration units and reaction definitions before interpreting the results.

Restarting chemistry Use Optional chemical initial conditions (inchem / savechem) for a matching chemical state. A supplied chemical checkpoint is passed as inchem. For an exact restart pair it with the matching flow state, mesh, species order and database from the same stage. Replacing just the flow state can invalidate a reactive restart.

Natural state then operation State each stage in chronological order with forcing, duration, target and acceptance criteria. Ask the Agent to qualify the preceding SAVE and compatible chemical state, then map them into the next stage. Inspect the handoff for element and continuum identities. An explicit steady-state objective needs its own convergence evidence.

Transient from prescribed initial data When the benchmark prescribes a starting state, specify it and request explicit direct transient start. Review early relaxation against the source. Do not silently treat the initial part of a transient as a physically verified natural state.

If a later stage stops Identify the last accepted stage, last native save and the unresolved requirement. Retain the earlier stage’s results and ask for an integrated account of achieved stages and limitations. Keep final-time or benchmark agreement claims restricted to the evidence actually available.

AUTOMATIC SIMULATION

Generate and reuse a mesh

For a reusable grid, choose Create mesh only. Describe the physical domain or select Generate mesh to use the dedicated form. An existing native mesh can also be imported directly.

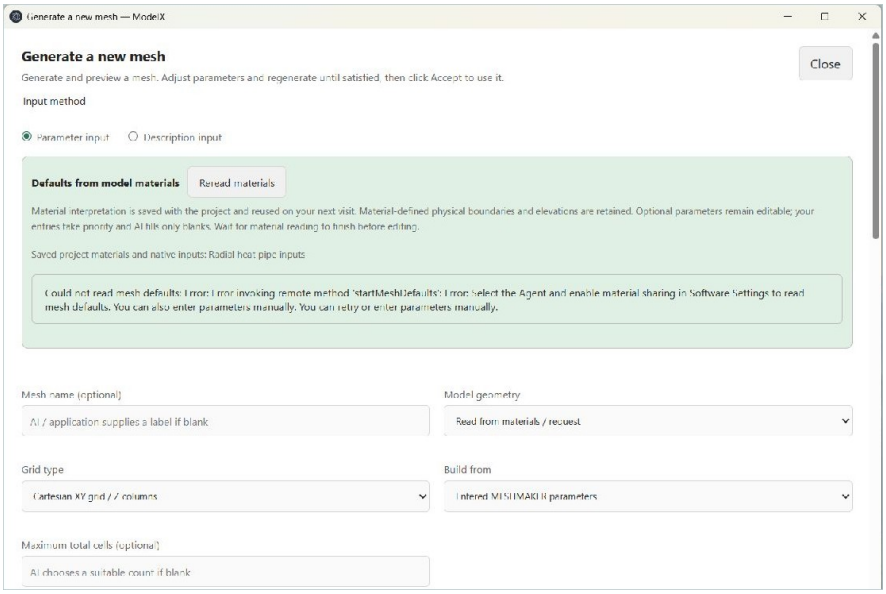


Figure 14. The mesh window offers Parameter input and Description input. Geometry, coordinate system and method determine which fields are available.

1. Choose the physical geometry: horizontal plane, vertical section, layered 3D or full axisymmetric RZ. Supply dimensions and units. Use Parameter input for coordinates, cell widths, radial interfaces and layer elevations. Use Description input to combine a model description with uploaded sources.
2. For a layered model, enter top and bottom elevations or supported surface files, material names and vertical cell counts. Where needed specify refinement, wells, cell shape and limits. RZ represents full annular volumes. For a confirmed planar model, review the stated 1 m out-of-plane fallback if no thickness was supplied.
3. Review the cell estimate, warnings, assumptions, generation log, preview and final audit. Check extents, materials, connection counts and refinement at the feature of interest. Accept a suitable dialog-generated grid. A mesh-only task retains its audited result under its task name.
4. On the completed mesh-only task use Use as project mesh. Check for Selected project mesh. Create a new task with the same project, software and module, choose Prepare inputs only and request reuse. Compare the MESH checksum or bytes in the two revisions when exact reuse matters.

For imported external grids, verify coordinate units and rock mappings before accepting the conversion. A new grid can change element labels and connectivity. Recheck every source, observation and initial-state mapping against the selected MESH.

AUTOMATIC SIMULATION

Choose a mesh construction route

Open Generate mesh in Automatic, or use the mesh tool in the native editor when available. Decide first whether you need a new grid, conversion of an external grid, or exact reuse of an accepted MESH.

Existing native MESH Select Import MESH or external grid in Automatic and choose MESH. Check that rock names, element labels and initial-state identifiers exist in your other inputs. Use the accepted native mesh directly when reproducing its results.

Parameter input Choose this for explicit control of dimensions, widths, layers and refinements. In Automatic let material reading finish. Open Parameter sources and suggestions to see what supplied evidence established. Reread materials after correcting a source. Where the boundary or layer fields are locked, correct the governing material.

Description input Describe the domain, units, geometry, features, materials, grading and maximum total cells. Use Instruction examples… as a starting point and replace its numbers with your own. The Agent can use supplied material and report assumptions. Check the realized geometry and cell count before accepting.

Model geometry and Grid type Choose both. Model geometry gives dimensional meaning (XY, XZ, YZ, RZ or layered 3D). Grid type determines which discretization fields appear. For a radial model, select Axisymmetric RZ and an axisymmetric grid type to display the radial-interface field.

Build from Entered MESHMAKER parameters is the normal choice for an unrefined structured grid with sufficient data. Agent from parameters and data files handles irregular footprints, varying surfaces, refinement or incomplete numerical choices. The available choices follow the geometry.

Task versus dialog Generate MESH builds a candidate in the dialog. Accept selects it for the task or editor draft. Create mesh only is an Automatic workflow that publishes the mesh and its audit. Prepare inputs only can generate a mesh as part of producing the complete simulation input set.

AUTOMATIC SIMULATION

Make a 100 cell Cartesian mesh

This training grid is small enough to check by hand. The target is a rectangular block 100 m long, 50 m wide and 10 m thick. It has 10 cells in X, 5 in Y and 2 in Z. These are exercise values.

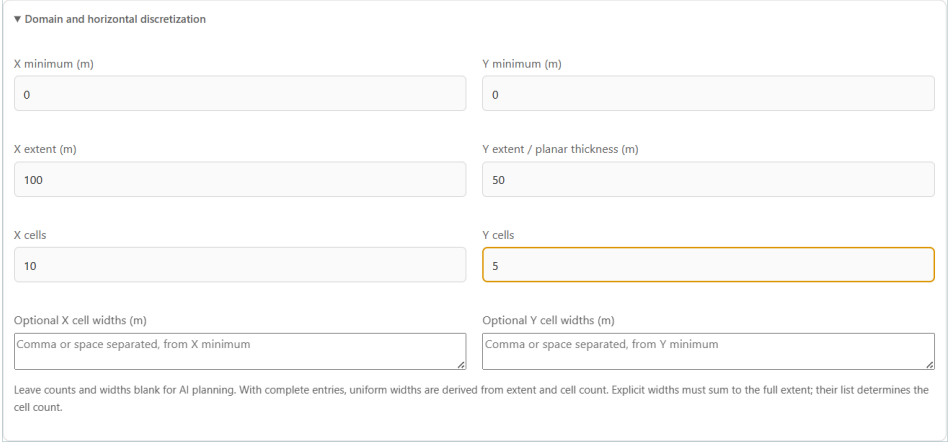


Figure 15. Cartesian domain and cell counts entered for the 100-cell exercise. Width lists are optional.

1. In a training project choose Generate mesh → Parameter input. Set Model geometry to 3D layered model, Grid type to Cartesian XY grid / Z columns and Build from to Entered MESHMAKER parameters. Leave Upload model boundary empty for the rectangle.
2. Under Domain and horizontal discretization enter X minimum 0, Y minimum 0, X extent 100 and Y extent 50, all in metres. Set X cells to 10 and Y cells to 5. Leave both width lists empty for uniform 10 m × 10 m footprints.
3. Under Geological layers set the first layer name to Training layer, Material to ROCK1, Top elevation to 0 m, Bottom elevation to −10 m and vertical cells to 2. Choose fixed values. Leave refinement off. Set Maximum total cells to 100 for this exercise.
4. Choose Generate MESH, read the generation log and open the preview. Expect 100 cells. For this fully connected rectangular block without added boundary cells, expect 90 X connections, 80 Y connections and 50 vertical connections, or 220 total. Each cell is 10 × 10 × 5 m and has volume 500 m³.
5. Check the footprint spans X = 0–100 m and Y = 0–50 m, the layer occupies Z = −10–0 m and the rock name is ROCK1. If counts differ, check axis counts, number of layers and boundary treatment before clicking Accept.

AUTOMATIC SIMULATION

Control spacing geometry and cell budgets

Choose a resolution that preserves the feature you intend to measure. The physical extent, number of cells and list of cell widths describe different quantities.

Uniform versus explicit widths For Cartesian X extent 100 m and X cells 10, each width is 10 m. For a graded example enter “5, 5, 10, 20, 30, 30” in Optional X cell widths (m). This defines six cells from the X minimum and sums to 100 m. Widths are lengths, not coordinates. Clear a conflicting count. Follow the same rule independently in Y.

Place an interface deliberately With X minimum 0, those six widths put faces at 0, 5, 10, 20, 40, 70 and 100 m. If a material interface must be at 40 m, it coincides with a face. A source specified at X = 40 m is on an interface. Identify its intended receiving element from the model definition.

Planar geometry An XY model has one vertical cell and uses the physical out-of-plane thickness. In a section, identify the active axes and give the missing direction’s physical thickness explicitly. Thickness scales control volumes and some connection areas. A confirmed planar model can default to 1 m with a warning. A 3D model needs real vertical extent.

Planning budget Maximum total cells (optional) sets a design target. Read Estimated total cells and check the native count after generation, especially after adding layers or refinement. To run a grid beyond the registered limit, contact TMG for a Paid User upgrade and refresh your account as described on page 15.

Worked change Keeping 5 Y cells and 2 vertical cells, the graded six-cell X list above gives 6 × 5 × 2 = 60 cells. Preserve the width sum and the location of the required interface if you coarsen the far field. Reducing physical thickness to fit a cell budget changes the physics.

What to delegate When resolution is unspecified, give the extent, required interfaces, features and budget. Let the Agent choose counts and grading. Read the stated sizes and assumptions, and inspect the smallest and largest cells in the preview.

AUTOMATIC SIMULATION

Define geological layers and varying surfaces

Elevations are in metres, positive upward. Geological layers are entered in top-to-bottom order. Vertical cell count controls numerical subdivisions within a geological layer.

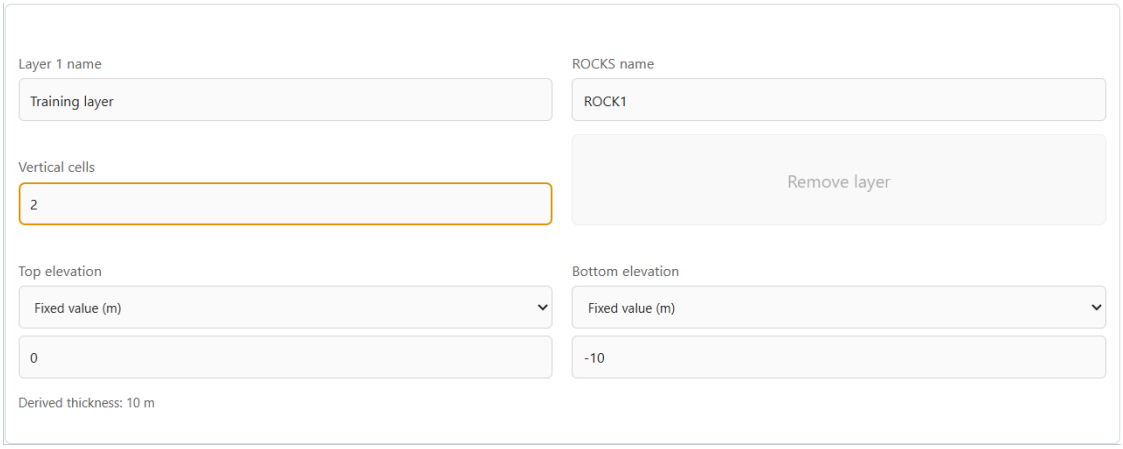


Figure 16. A fixed-elevation geological layer with two vertical cells and native material ROCK1.

1. For a uniform layer choose Fixed value (m) at the top and bottom. Set a descriptive layer name, the corresponding native material name and a positive integer for cells. In the example, top 0 and bottom −10 with two cells places an internal face at −5 m.
2. In 3D, use Add layer for each additional geological unit. From layer 2 onward the top inherits the preceding bottom. Set the new bottom, material and subdivisions. For example, adding a unit below −10 m down to −30 m with four cells yields six vertical subdivisions in total. With the 10 × 5 footprint this gives 300 cells.
3. For a variable interface choose the elevation-file option for layer 1's top or a layer's bottom. Use one UTF-8 CSV per surface with header x,y,elevation. A row such as 0,0,100 means elevation +100 m at the origin. Use the same datum and horizontal reference for every file.
4. Include boundary and interior samples and at least three noncollinear XY locations. Avoid duplicate XY locations with conflicting elevations. XLSX accepts the same headers on its first sheet; TXT/XYZ accepts the header with comma, space or tab separators. Select a previously uploaded surface instead of duplicating it.

Check a pinch-out A surface coincidence or inversion can collapse local thickness with a warning. Inspect the actual coverage, collapsed areas, lateral connections and remaining cells; thin subdivisions may merge inside their own unit. Resolve an accidental depth-versus-elevation sign reversal before using the grid.

AUTOMATIC SIMULATION

Create and check an axisymmetric mesh

Choose a radial grid for a full 360° domain represented by cylindrical shells. The radial interface list describes cell faces. Source locations and observations are associated with native elements.

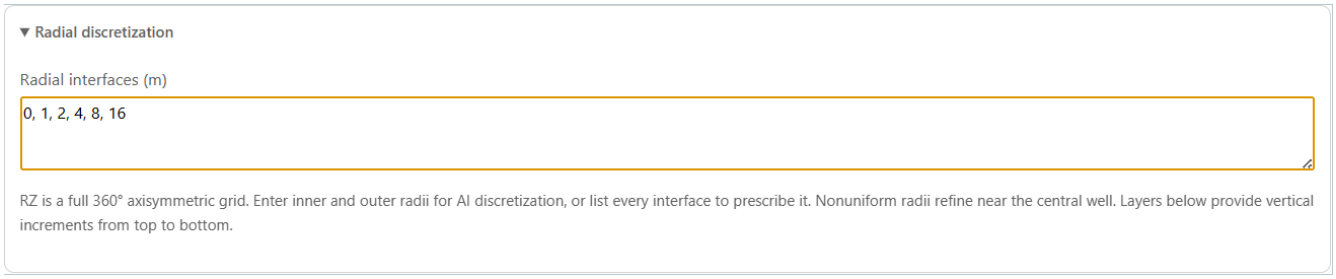


Figure 17. Radial interface entry for a five-annulus training exercise.

1. In Parameter input choose Model geometry → Axisymmetric RZ (full 360°). Also set Grid type to Axisymmetric RZ2D or the source-prescribed RZ2DL option. Preserve the native type when reproducing a benchmark. Confirm that Radial discretization has appeared.
2. For a training disk enter the six radial interfaces “0, 1, 2, 4, 8, 16” m in ascending order. Set the vertical layer from 0 to −2 m with one vertical cell and the intended rock. Entering every face prescribes five annuli. Entering just the outer and inner bounds can delegate the intermediate grading.
3. Generate MESH. For this one-layer exercise with no added boundary cells, expect five cells and four radial connections. The cells widen outward. The innermost volume is $\pi \times 1^2 \times 2 \approx 6.283$ m³ and the total is $\pi \times 16^2 \times 2 \approx 1{,}608.50$ m³. A planar 1 m extrusion would yield different volumes.
4. Inspect the native element IDs, radial extent, layer thickness, connections and central source assignment. For finite-volume profiles use the native cell-center coordinates reported for results. An interface radius, a cell-center radius and a threshold interpolated between centers have different meanings.

For an annular domain Use a nonzero inner radius when required by the source. A positive inner radius removes the central disk. State the boundary condition at that inner surface and confirm which element receives any source. For an off-axis well or asymmetric geology, reassess whether axisymmetry represents the problem.

AUTOMATIC SIMULATION

Use a boundary outline or import an external grid

An outline defines the boundary for new cells. An imported grid already contains cells and connectivity. Select the appropriate input so that ModelX preserves the geometry you intend to use.

Closed outline for a new mesh In Generate mesh expand Model boundary (Optional) → Upload model boundary. Provide CSV/TXT with header x,y and vertices in perimeter order. A rectangle 100 × 50 m can use successive rows 0,0 then 100,0 then 100,50 then 0,50 then 0,0. Repeat the first point to close. GeoJSON Polygon/MultiPolygon can encode holes. Declare non-metre units and coordinate reference in Additional mesh requirements.

Supported external grids In Automatic choose Import MESH or external grid. Select Gmsh .msh, VTK .vtk/.vtu, Abaqus .inp or an ECLIPSE corner-point .grdecl/.DATA deck. For a deck with INCLUDE files, supply a ZIP with the entry deck and its original relative include paths. A native MESH can be selected directly.

Coordinate units Open External grid conversion options. Auto reads METRIC, FIELD or LAB for corner-point decks and otherwise defaults to metres. Explicit choices include metres, centimetres, millimetres, kilometres and feet. Compare a known dimension after conversion. A 100 ft dimension should be approximately 30.48 m.

Rock mapping Set Rock for untagged cells and enter optional mappings such as “aquifer=ROCK1, 2=ROCK2”. Map to names present in the flow deck. Check the resulting rock counts and which cells received the fallback. Corner-point conversion retains ACTNUM and ROCKNUM/SATNUM regions and converts depth into elevation.

Planar import For an XY-planar external grid supply the physical 2D extrusion thickness in metres. The extrusion is along +Z. Check the resulting volume and layer location. Leave this field empty for a genuinely 3D grid.

Finish conversion Inspect the converted grid, mapping summary and warnings. Changing conversion options requires conversion again. Remove the selected grid before choosing generation as an alternative. Keep the source grid intact, along with the conversion evidence and accepted native MESH.

AUTOMATIC SIMULATION

Control well and fracture refinement

Local refinement must preserve physical dimensions, material boundaries and the native connections used by the solver. Choose the footprint and refinement method according to the feature.

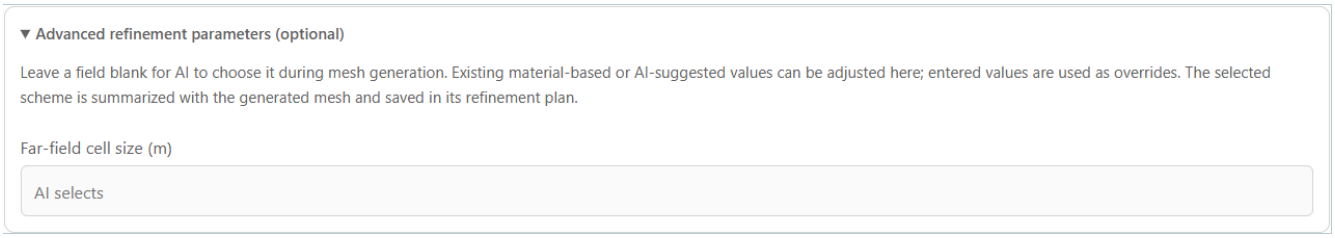


Figure 18. Optional well controls. Leave unprescribed numerical fields blank to delegate their selection.

New or rebuilt well refinement Select an irregular grid and enable Local well refinement. Use material-backed coordinates or Add well and enter Well X and Well Y in metres. Well name is optional. Do not infer an unknown well position from a drawing without a stated scale. Existing grids can be reused without rebuilding them.

Advanced controls Far-field cell size sets the background spacing. Near-well size controls local resolution. Refinement radius sets the reach of the local region. Radial growth ratio controls outward coarsening, and Angular directions sets the number of directions around a well. Supply only justified overrides. Leave other fields blank for Agent planning and read back the selected values.

Well mesh acceptance Expect radial Voronoi generator sites, a regular Cartesian far field and conforming polygonal transitions. Inspect the retained well location, actual shared faces and positive native volumes. Every connection must meet the 1×10^{-6} degree orthogonality tolerance before it is called qualified. Check the reported worst connection and ensure native coordinates are generator sites.

Fractures For a material-defined fracture, preserve orientation, aperture and rock identity. For a Y-aligned fracture, refine matrix cells on both X sides with at least two refined layers and graded outward transitions. Give the physical aperture and ask for near/far sizes and growth in the record. The usual adjacent growth bound is 2.

Planar cell shape For explicitly triangular footprints choose Irregular planar grid → 2D triangular grid (Gmsh). Layers stack into triangular prisms. For local well refinement the Voronoi requirement disables incompatible triangle and quadrilateral choices. Evaluate any inclined fracture against its actual orientation and audit scope.

MESH CONSTRUCTION

Build an irregular grid

Choose the footprint from the physical feature you need to resolve. A concave outline, a thin fracture and a fluid well call for different cell arrangements.

1. Open the project in Automatic. Add the geometry or measurements under Model materials, then open Generate mesh and choose Parameter input. Check Parameter sources and suggestions. For horizontal coordinates choose 2D horizontal (XY) or 3D layered model as appropriate.
2. Under Grid type select Irregular planar grid / Z columns. Use Agent from parameters and data files. Give the boundary, coordinate units, layer elevations or physical thickness, ROCKS names and Maximum total cells. A CSV boundary uses x,y in perimeter order and repeats its first point to close the loop.

Automatic planar cells / Z columns Choose this when the feature determines the appropriate shape. A mixed mesh can retain regular quadrilaterals in the far field and use conforming irregular cells in the transition. Give a known flow direction so a grid axis can follow it where geometry permits.

2D quadrilateral grid / Z columns Choose quadrilateral footprints if the requested geometry permits four-sided cells throughout. Check shared faces around bends and narrow regions. Each vertical interval adds a layer of hexahedral cells.

2D triangular grid (Gmsh) Choose this under Planar cell shape when the base should be triangulated. The ModelX Gmsh route stacks triangles into prisms. Specify coarse far-field spacing and required interfaces. Where material evidence defines a fracture, the route also refines the surrounding matrix.

2D polygonal grid / Z columns Use polygonal footprints for transitions or local well refinement. Select Local radial refinement around wells for a new well-refined grid. That choice constrains the footprint to the Voronoi construction.

Choose Generate MESH. Read the resulting method, native counts, warnings and assumptions. Inspect the preview and confirm the actual footprint and Z levels before accepting. The following example gives you a boundary and an independent volume check.

MESH CONSTRUCTION

Make an L-shaped triangular mesh

This training grid has a re-entrant corner. The missing corner gives you a quick way to spot a wrong outline, even when the cell count looks plausible.

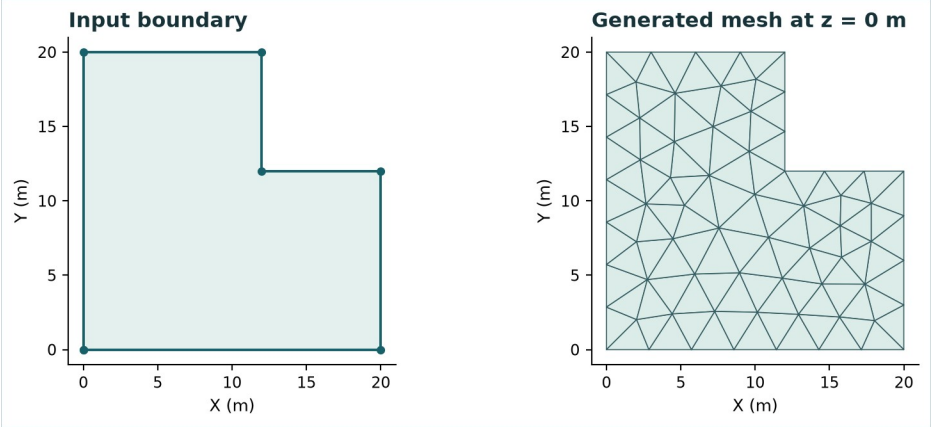


Figure 19. The input outline and the top faces read from the ModelX-generated grid. Both axes are in metres. The right panel shows a mesh generated by the scientific tool for this example.

1. Save a CSV with header x,y. Use the following perimeter order in metres. The vertices are (0,0), (20,0), (20,12), (12,12), (12,20), (0,20) and (0,0). Write each pair on its own line without parentheses. Choose Model boundary (Optional) → Upload model boundary.
2. In Parameter input choose 3D layered model, Irregular planar grid / Z columns and 2D triangular grid (Gmsh). Enter one ROCK1 layer, top 0 m, bottom −5 m and one vertical cell. Set a budget of 1,000 total cells. Leave well refinement off. In Additional mesh requirements request approximately 3 m planar spacing, with no wells, sources or fixed boundary cells. Generate MESH.

Check the corner and volume The footprint is 20 × 20 minus 8 × 8 = 336 m². The slab volume is 1,680 m³. No element should fill the upper-right notch. The pictured mesh has 104 triangular prisms and a total native volume of 1,679.99945 m³ after file rounding. A different valid tessellation can have a different count.

Retain the result Inspect the mesh and geometry records, then choose Accept. To publish only the mesh, complete a Create mesh only task. Select Use as project mesh before starting a separate Prepare inputs only task that should reuse it.

MESH CONSTRUCTION

Design local refinement and check shared faces

Use the following two recipes for different physical features. Settle the physical location, aperture or model thickness from your study before allowing the Agent to choose numerical spacing.

A well in a regular background

1. Choose Irregular planar grid / Z columns. Under Refinement, cell type and mesh boundaries enable Local radial refinement around wells. Check the well positions read from materials. Use Add well to enter a missing name and X/Y position in metres, or Remove well to correct the list.
2. Leave Advanced refinement parameters blank to delegate spacing, or specify Far-field cell size and individual near-well size, refinement radius, growth and angular directions. For a small training geometry, try a 100 × 100 m footprint, one 5 m layer and one well at (50, 50) m. Ask for a coarser outer grid, a conforming transition and a total below 1,000 cells. These are exercise inputs.

What to inspect Zoom from the full domain to the well. Inspect the actual polygon faces and retained generator coordinates. In the written MESH, volumes, face areas and connection distances must agree with that geometry. Every connection must pass the 0.000001° shared-face orthogonality check before calling this well grid qualified.

A material-defined fracture without a well

1. Provide the fracture endpoints, physical aperture, orientation and rock name. Choose 2D triangular grid (Gmsh) for a triangular-prism base. Keep the layer interfaces. Read the selected near and far sizes in the generation record.

What to inspect For a Y-aligned fracture, inspect X on both sides. Look for at least two refined matrix layers and outward grading, normally with adjacent growth no greater than 2. Check the physical aperture, material identity and shared faces. The built-in thin-region check covers named axis-aligned fractures. An inclined fracture needs evidence measured in its own normal direction.

AUTOMATIC SIMULATION

Accept a mesh and reuse its exact bytes

Preview checks geometry. Acceptance attaches the candidate to the task or editor. Publication and subsequent input preparation are separate actions.

1. After Generate MESH finishes, read the reported method, actual element and connection counts, Warnings and assumptions and Generation log. Compare physical extent, thickness, material identifiers, regional volumes, boundary cells and refinement with the request. Read the reported audit and any exclusions.
2. Open the mesh preview. Inspect the whole domain first, then zoom near interfaces, wells and fractures. Drag to pan, double-click a feature to center and zoom, and use Fit to return to the full view. Check actual model coordinates rather than assuming the plot aspect ratio proves correct dimensions.
3. If the candidate needs a change, edit the parameters and choose Regenerate MESH. After input or source changes the previous preview cannot be accepted. If an existing mesh is present, review the replacement checkbox carefully. Accept attaches the candidate. Closing the window without accepting preserves the previous selection.
4. For a reusable mesh-only job, finish Create mesh only and use Use as project mesh on the completed task. Create a separate Prepare inputs only task in the same project and module, confirm Selected project mesh, and explicitly request reuse. After Inputs ready use Open prepared input delivery and inspect the actual native files.

Verify exact reuse

In PowerShell use Get-FileHash -Algorithm SHA256 -LiteralPath 'D:\Study\mesh-only\MESH' and repeat for the actual delivered MESH in the input-only revision. Replace the example paths with the real paths. Equal SHA256 values establish identical bytes. Equal cell counts alone do not establish this. On Linux use sha256sum on both files. On macOS use shasum -a 256.

What completion looks like The mesh-only delivery has geometry and audit evidence. The input-only delivery adds the controls, initial conditions and sources required by that case. For reactive cases also check transport, chemistry and database identity. Neither workflow requires a simulator job.

MESH CONSTRUCTION

Use mesh instructions and inspect a candidate

Start from a description example for a whole grid or an instruction example for a change. In both cases, read the final text and review the resulting candidate before you select it.

Description examples… In Description input, search the library for regular 2D, layered Cartesian, axisymmetric, triangular fracture, two-well Voronoi or irregular boundary with a hole. Replace example coordinates and units with your own. Parameter input offers Instruction examples… beside Additional mesh requirements.

Edit and combine examples Use Find an example and Edit this example. Fill every bracketed value. Add to requirements appends to the current instructions. Reset example restores that card’s original wording. XY examples need a planar layout and a well-refinement example needs its compatible well setting.

Change geometry or discretization Examples cover adding, moving or removing fractures, refining nearby matrix or a selected region, coarsening the far field and well refinement. Other cards excise a polygon or circle, trim an outline, change vertical subdivisions, use elevation surfaces, assign a material, request large-volume boundary faces or reduce the cell count. A hole requires no connections across the void. Large-volume boundaries change native capacity and need a stated physical purpose.

Read the preview Open Show MESH plot. Color by material shows rock assignment. Color by first type boundary helps locate marked boundary cells. Read the associated legend and any warning. Drag to pan, use Zoom + and Zoom − to inspect transitions, and Fit to return to the whole model.

Change or accept Use Cancel material analysis or Cancel generation to stop the current operation. If parameters or source materials change, use Regenerate MESH. For an existing grid, read the replacement checkbox before Accept. In Automatic the candidate becomes the task mesh. In Model it becomes an editor draft that you retain with Save new revision. Return to Automatic or Return to editor closes the tool.

AUTOMATIC SIMULATION

Initial state and continuation

The starting state controls what the transient means. Choose it from the source model and the objective. A numerical run can reach its target time with an unsuitable initial state.

Initial state choices

Agent selects from model evidence Use when the supplied material establishes the physical starting state and you want the Agent to select and justify the route.

Natural-state initialization required Prepare and qualify a predecessor stage before applying operational forcing. Check its acceptance and the verified restart into the main stage, including element mapping and a compatible reactive state where applicable.

Use supplied INCON Attach the initial conditions that correspond to the selected mesh and module. Review element identities, phase variables, pressures, temperatures and chemical consistency. A filename alone does not establish compatibility.

Explicit direct transient start Use when the documented problem starts from prescribed initial conditions. Specify the values and their basis. For a benchmark, retain and discuss any initial relaxation.

Continue an existing simulation

1. Choose Continue an existing simulation and select Task to continue. Review the source name, date, inherited requirements, achieved stage and whether the results are partial.

Redo the complete simulation workflow Use for changes to physics, source rates, boundaries, mesh or numerical controls that require new results. If offered, select Latest main run or Accepted initialization checkpoint as appropriate. Review the proposed changes before proceeding.

Redo postprocessing and report only Reuse the calculated output to select or regenerate figures and create a report. Choose this for a new set of plots, a revised comparison or analysis of an informative partial interval.

Rewrite the report only Reuse existing results and figures with revised narrative or presentation instructions. Availability depends on a retained dataset. Request corrected claims or a different audience here when no new physics or calculation is needed.

AUTOMATIC SIMULATION

Monitor the Agent and handle recovery

After Start task, watch Current automatic simulation task. ModelX records preparation, initialization where requested, execution, scientific review and delivery as separate stages. Use the stage and evidence to decide whether any action is needed.

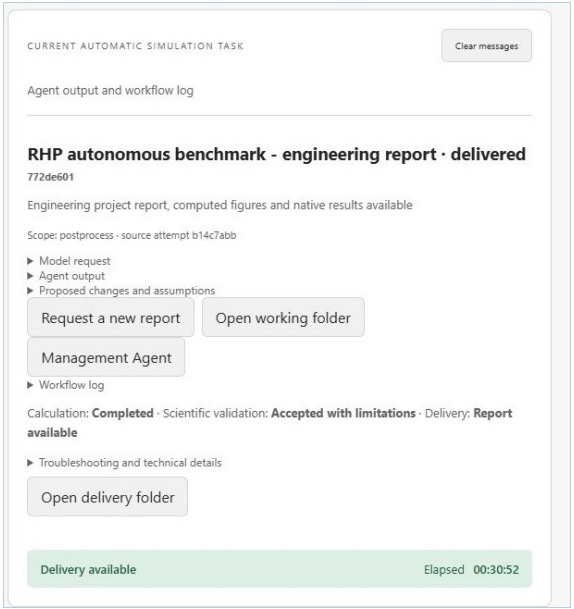


Figure 20. A delivered RHP task appears in the current-task panel. Its task name and status identify the delivery associated with this run.

Task records Expand Model request, Agent output, Proposed changes and assumptions, Continuation plan or Workflow log where present. Clear messages clears the displayed log after completion. It does not erase the task or its native results.

Management Agent Open the task-specific window for progress, questions and recovery guidance. Use Jump to latest to follow a discussion. Read How questions affect this task before sending instructions. Report a problem opens a reviewed support draft.

Needs information or attention Read the stated cause and inspect the source evidence. Use Review problem and continue when available. Add missing materials, select the applicable recovery plan, supply a specific clarification and apply the plan. Keep the existing task and its accepted evidence when recovering.

Continue or cancel Continue task advances a task awaiting your review. Cancel task requests a stop. While Stopping… is displayed, wait for the recorded status before starting another task. Open prepared input delivery is available at Inputs ready.

Finished or partly delivered Read Calculation, scientific review, overall objective and delivery status together. Open working folder locates working files. Open delivery folder opens the published results when available. A partial or qualified report explains the achieved interval and unsupported conclusions.

If only a figure or report failed, continue with the retained run. For an input incompatibility or physical failure, change the relevant assumption or input in a new revision and reassess the affected results.

AUTOMATIC SIMULATION

Recover a task without losing accepted results

Begin with the outcome that failed. A solver failure, a physical disagreement and a missing report figure require different action even if the same task banner requests attention.

1. Open the task in Automatic. Read Calculation, Scientific validation, Delivery and Overall objective separately. Expand Workflow log and the scientific review or evidence package where available. Record the first failed stage, the achieved time and the exact missing item or diagnostic.
2. Open Management Agent for this task. Describe the observed problem in terms of the current study. For a paused attempt choose Review problem and continue, inspect the options, and select Let Agent diagnose and continue this attempt when appropriate. Attach the missing reference or clarify a genuine source conflict. Choose Apply plan and continue this task.

Example: input audit rejects a source Compare the named source element with the actual MESH and GENER. If a mesh changed, require an evidence-based mapping to the intended physical location. Ask for a corrected input revision and an audit. A successful retry establishes only what that retry actually checked.

Example: calculation completed, plot missing Locate the accepted job and last saved native time. Choose postprocessing and report only for replacement figures, or report only for prose edits. Check the new delivery references the same job and that its limitations describe any omitted view.

Example: intermediate run stopped Read the termination and accepted times. A retained partial interval may support a diagnostic report. State that interval, show the data available and identify what would require a future run. A lack of final-time evidence precludes a final-time comparison.

When human judgment matters Resolve contradictory source values, permissions to share sensitive information, a changed scientific objective or an unsupported process explicitly. After reviewing a problem, a user can save a diagnostic or send it through Support and official updates. Keep project evidence with the task.

AUTOMATIC WORKFLOWS

Read task activity and choose a recovery action

A task can finish its calculation while a comparison, illustration or report still needs work. Read Calculation, Scientific validation, Delivery and Overall objective together before choosing an action.

Trace an event Open the task's Model request, Agent output, Structured mesh plan or Proposed changes and assumptions where present. Startup comparison qualifications describe limitations known at the start. Work progress details and Attention needed show the current stage. Earlier messages, Latest messages and Jump to latest help when the log grows. Clear messages clears the displayed output after the task finishes.

Read solver evidence and cost View terminal output opens process output. Native simulation output opens the simulator's own listing. Use Refresh, Beginning, Previous, Next or Latest output to inspect the relevant interval. Task tokens and estimated cost breaks usage down by activity where reported. Missing token or price information means the amount is unknown.

Resume preparation or execution Open Review problem and continue. Read the suggested checks and any message about automatic continuation. Add missing materials when offered. Choose Let Agent complete preparation or Let Agent diagnose and continue this attempt. Rebuild inputs using retained materials suits a change to model setup. Edit Your guidance and choose Apply plan and continue this task. For a missing executable or parallel setup, use Resolve execution setup and continue when offered.

Intervene during a run Use Ask about this task in Management Agent to inspect evidence. Stop answer interrupts the reply. If the Agent presents a correction plan, review the affected inputs before Stop and apply correction. This stops the current run and requires corrected inputs to pass their audits before a new run starts.

Deliver what is available Use Report available evidence without another simulation for a reporting problem. Request a new report takes a new set of report requirements and reuses the accepted run. Where the manager offers closeout, choose Prepare report from available results or Finish without a report according to what the study needs.

MANUAL SIMULATION

Import and edit native input files

Use Model when you already have native inputs or want direct control over an Agent-prepared revision. A manual edit creates a new revision so earlier runs can still be traced to their original inputs.

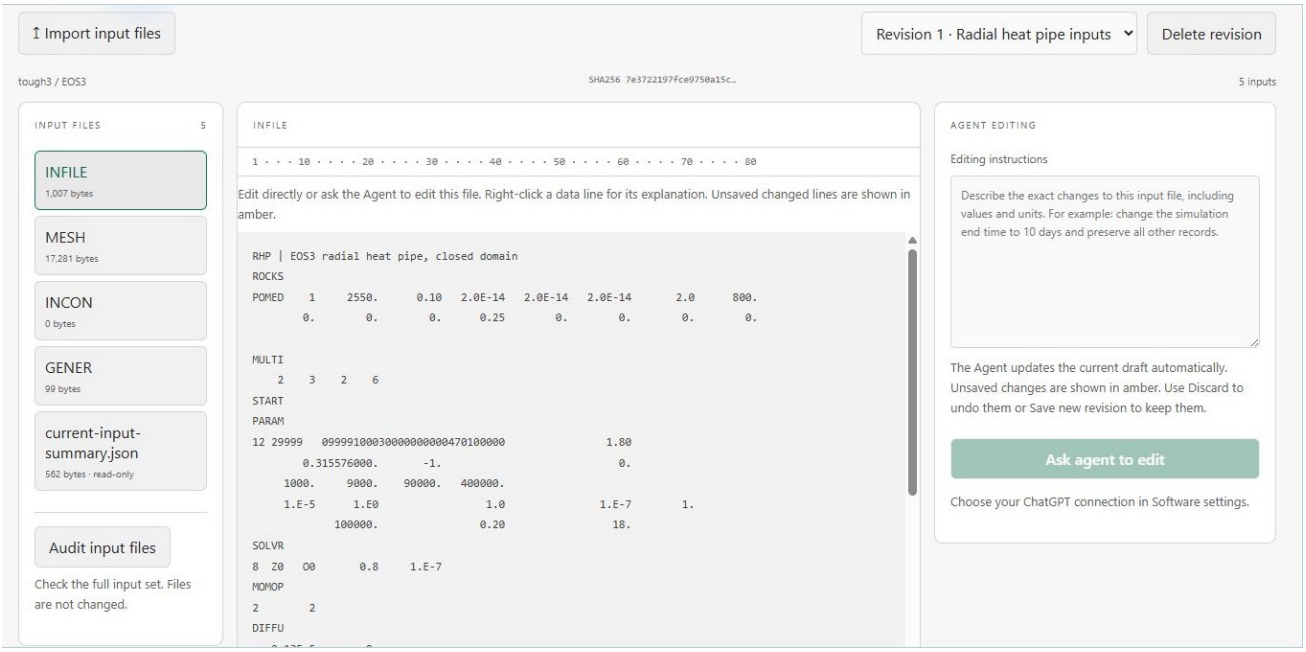


Figure 21. The file list is on the left, the native text editor is in the center and optional Agent editing is on the right. The RHP flow deck is shown.

1. Select or create the project. Open Model → Import input files. Select the related native files as one coherent set. Confirm the simulator and module associated with the revision. Alternatively select the revision delivered by Prepare inputs only.
2. Choose Revision, then select the file in Input files. Inspect the fixed-column ruler and any field or line help available. Edit values in place without disturbing required field widths, section terminators, element names or units. Generated summaries are read-only.
3. Choose Save new revision for an intentional change. Discard abandons an unsaved draft. Select the newly saved revision before auditing or running. Optional Ask agent to edit applies file-specific instructions through the configured connection. Review the resulting changes.
4. Click Audit input files. Read all errors, warnings and requests for review. Check mesh/material mapping, initial-state coverage, source labels, observation elements, run horizon and output controls. Correct blocking issues in a new revision.

For a change to a heat source, compare the source element, source type and rate in both revisions. If a grid was reused, verify the native mesh bytes and that the source label still resolves to the intended cell.

MANUAL SIMULATION

Edit native inputs and keep a reproducible revision

Each native filename has a specific role in the solved model. Check related files together whenever you change geometry, sources, initial state or output controls.

INFILE or flow.inp Check equation-of-state assumptions, rock definitions, time controls, gravity orientation, output selections and the required source and boundary treatment. Preserve the native record format and units. Some cases specify initial conditions or sources inside the main deck.

MESH ELEME identifies elements, materials, volumes and locations. CONNE describes neighbours and transport geometry. A changed element name can invalidate sources, restarts and history requests. Prefer the mesh generation or import tools for a topology change so that native geometry and its audit agree.

INCON Inspect the initial state and element identifiers for the selected module. The same numerical column can mean different primary variables under a different EOS or phase state. When importing a restart, verify the mesh, element and continuum order, admissible phase variables and the stage that produced it.

GENER Check source element, type, rate, schedule and sign convention against the simulator reference. For a heat source verify power in watts. For a fluid source identify the component and required enthalpy or temperature convention. A value expressed in kg/s cannot stand in for a heat rate.

A controlled edit

1. Select the baseline in Model. Choose GENER and locate the identified heat source. For a sensitivity exercise on a case with a documented 3,000 W constant heat source, change only that source to 3,300 W. Record the 10% increase in the revision name or study notes. A benchmark reproduction should retain the source value.
2. Review fixed-width alignment, source type, element and schedule. Use Save new revision. If using Ask agent to edit, enter the intended change and units. The Agent updates the draft, with unsaved edits shown in amber. Use Discard to abandon the draft or save it after review. Reopen the saved file before auditing.

MANUAL SIMULATION

Use the native editing examples

In Model, select the input revision and file before opening Editing examples…. The examples for MESH, INCON and GENER address different native records. Work on a new revision so you can compare the changes.

Understand a line Right-click in the native editor with no text selected to open the line explanation where available. The keyboard route is the context-menu key or Shift+F10. With text selected, the native edit menu offers Copy and, in editable fields, Cut and Paste. Select all applies to the focused text surface.

MESH Examples cover large-volume boundary cells, identifying a constant-temperature boundary, assigning rocks by geological layer, and renaming elements by layer codes or a coordinate region. A change to an element name also affects references in connections, initial conditions, sources and observations. Specify the full mapping and audit the dependent files.

INCON Examples insert a primary variable or calculate hydrostatic pressure or a temperature gradient from a reference elevation. Supply the reference value, elevation, units and sign convention. Confirm variable order and phase state for the selected EOS before accepting the draft.

GENER Examples include time-dependent water or steam injection, gas or component injection, scheduled production and shut-in, heat injection, and DELV production at a specified bottomhole pressure. Give the target element, component, rate or pressure units, schedule and applicable enthalpy. Check each transition against the intended time base.

Inspect the proposed edit Append the edited example to Agent editing instructions, then choose Ask agent to edit. Cancel agent request stops a pending edit. Review the changed lines against the original and use Discard or Save new revision. Audit input files checks the selected inputs. Repair errors with Agent requests a repair and reaudit. Cancel repair stops that request. In Runs, Open Model to repair inputs returns to the editor after a pre-run finding.

MANUAL SIMULATION

Read an input audit and decide what to correct

Run Audit input files on the revision or draft shown in Model. The audit reports errors, warnings and review items. Its coverage depends on the simulator, module and native files present.

Error Read the file, element, record or line identified by the finding. Correct the cause and all dependent inputs. A source element that does not exist cannot be fixed by changing only the run duration. Use the native deck and mesh as the governing evidence.

Warning Decide whether the stated risk applies to this model. For example, a deliberately unusual property can be meaningful if its units and source are documented. Record why an accepted warning is scientifically defensible and what conclusions it limits.

Review item Check the part the automatic audit could not establish from the available evidence. An unverified initial-state mapping calls for an element-by-element comparison or a compatible reference. “No errors found in completed checks” leaves these items for review.

Agent-assisted correction When errors are reported, Repair errors with Agent may be available. Inspect the problem and revision before requesting it. Read the resulting changed files, revision and reaudit. For manual correction, edit the saved revision into a new one and run Audit input files again.

Before releasing inputs for execution

1. Compare native element, source and observation IDs across the files. Inspect a boundary cell and a representative interior cell. Verify source units, positive/negative conventions and cumulative schedule duration.
2. Confirm the end time, the requested saved-time schedule and output variables. If you need a native FOFT or COFT history, specify the target element or connection before the run. For reactive work, check species, coupling flags and the filename in solute.inp against the supplied database.
3. Record the revision, any remaining warnings and the acceptance decision. Select that same revision in Runs. Changing a file outside the reviewed revision breaks the link between this audit and the intended calculation.

MANUAL SIMULATION

Run a saved revision manually

Open Runs and select the saved input revision. Direct run gives you control over execution without starting the full Agent preparation and reporting workflow. It is also a reproducible way to run a reviewed input-only delivery.

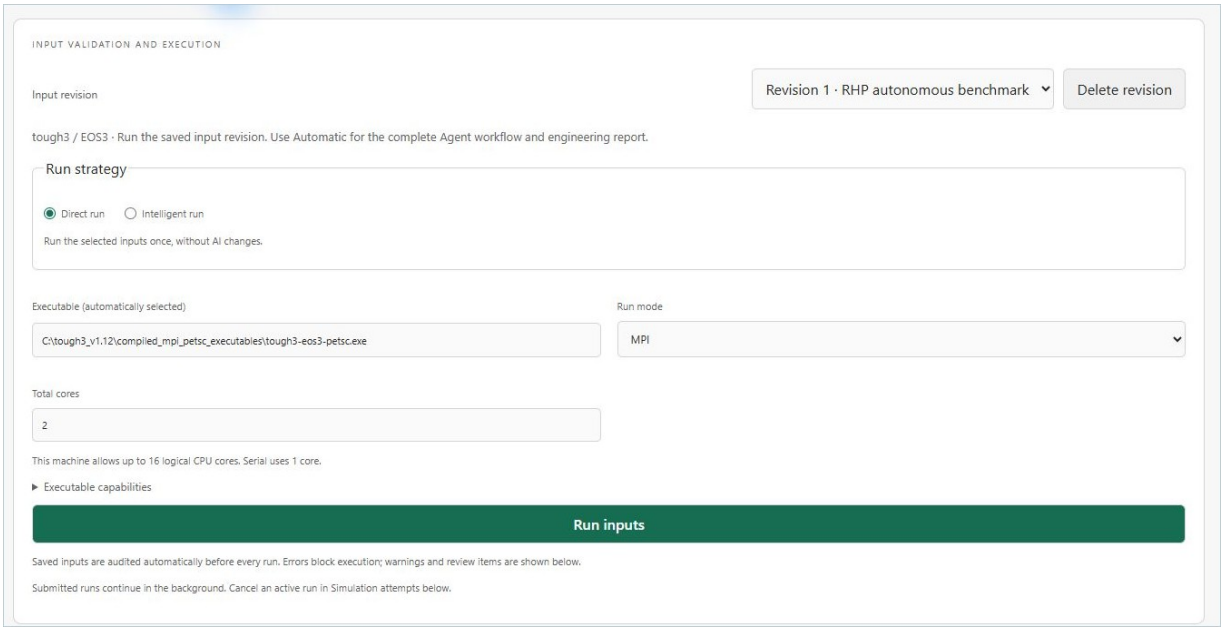


Figure 22. Runs shows the selected revision, execution strategy, matching executable and processor controls. The example shows an MPI registration.

1. Check the revision name, simulator and module. Select Direct run. Inspect the automatically selected executable. If it is absent or wrong, return to Simulator Management and verify the matching registration/default.
2. Select an available Run mode. Serial uses one core. MPI uses processes. OpenMP uses threads in one process. Hybrid divides the total cores among MPI processes. For a hybrid job, choose a total divisible by the process count. Read Executable capabilities for the available choices.
3. Select Run inputs. ModelX audits the inputs and checks the total cell count against the authenticated allowance. If the mesh exceeds the registered allowance, contact TMG for a Paid User upgrade (page 15). Review other errors and warnings beside the run controls.
4. Select the job in the run list. View terminal output opens captured process output. Native simulation output opens the engine’s native log. Open working folder locates the native input snapshot, logs, results and available restart files.

Intelligent run is offered for supported registrations, including TOUGH3 EOS3 and TOUGHREACT. It adds managed review and recovery for the selected saved revision and needs a suitable Agent connection. Choose Automatic for independent input preparation through engineering delivery.

MANUAL SIMULATION

Select processor settings and diagnose startup

In Runs, choose the saved revision, then inspect the matching executable and its reported capabilities. Select settings supported by that binary and its installed runtime.

Serial Choose a serial executable and one core for a small serial case. This is often the simplest check when commissioning a new simulator installation. A serial run of a known deck verifies a different path from an MPI run.

MPI Choose an MPI-enabled registration and the intended process count. Install a compatible MPI launcher and libraries for that build. Each MPI rank is a process. A message about a missing launcher or runtime DLL belongs to the execution environment.

OpenMP Choose a build that supports threads and set total cores within its capability and your machine's available resources. OpenMP normally runs one process with multiple threads. More cores may add overhead for small models.

Hybrid Select a hybrid-capable executable. For example, eight total cores and two MPI processes gives four OpenMP threads per rank. The total must divide evenly; this interface expects at least two processes and two threads per process for a hybrid configuration.

Direct or intelligent Direct run executes the selected inputs. An eligible Intelligent run uses the Agent to review, diagnose and potentially correct inputs and retry. Choose Direct run when comparing an unchanged revision or reproducing a specific execution. Automatic additionally supports independent preparation and engineering delivery.

Interpret the first failure

1. Select Run inputs. If no job starts, inspect the input audit, mesh allowance and runtime selection. For a registered-user cell limit, see the TMG Paid User upgrade instructions on page 15. If a job starts then exits, open View terminal output and check the launcher or process error.
2. If the solver opened the deck and reported convergence trouble, switch to Native simulation output and inspect the last accepted time, element and diagnostic. Record whether a valid checkpoint exists. Changing a processor count alone supplies no evidence that a physical issue was resolved.

Availability of Intelligent run The current Runs control enables Intelligent run for a matching TOUGH3 EOS3 or TOUGHREACT runtime. Use Executable capabilities for the selected binary. A run mode marked unavailable or reserved cannot be selected for that runtime.

MANUAL SIMULATION

Check a run before using its results

Record which project, revision, job, executable and module produced the data. Then answer three questions independently: Did the solver finish? Are the states physically admissible? How well do they match the comparison evidence?

Read the native record

1. In Runs, open View terminal output for process or launcher messages. Open Native simulation output for time steps, convergence messages, accepted states and termination. Check the native final time against the request. Distinguish rejected iterations from accepted output.
2. Inspect output coverage. Confirm the expected number of mesh elements and saved times, the requested variables and units, and the presence of required histories. A run can reach its final time without saving the observations needed for your question.
3. Compare initial and final pressure, temperature and saturation with the specified bounds. Check source signs and units, unaffected regions and boundary behavior. For reactive models, also inspect chemical species definitions, concentrations, mineral units and restart consistency.
4. Use an independent benchmark with matched times, spatial positions and definitions. Report the error metric and tolerance. Compare total inventories or flux balances only to the precision supported by the native records.

Choose the next action

Incomplete but informative Keep the supported interval and report why the run stopped. Label the last accepted time and withhold final-time claims. Use the available diagnostic delivery or postprocessing continuation.

Numerically complete with open scientific issues Keep the native outputs and the reviewer’s qualifications. Distinguish the usable portion from any claim requiring a different starting state, improved model or additional measurements.

Verified calculation with a presentation problem Keep the accepted job. Change figure or report requirements, then use postprocessing or report-only delivery. No solver restart is needed to change a caption or a plot.

MANUAL SIMULATION

Compare a calculation with a reference

Use the same definition on both sides of a comparison. A visually similar curve at a nearby time is weaker evidence than a matched native observation with known units.

1. Record the job ID, revision, engine, module, mesh identity, target end time and accepted end time. List the saved times that actually exist. Document numerical completion and physical admissibility before addressing benchmark agreement.
2. Choose a reference point or profile, the physical coordinate and the variable definition. Match phase, component, units, datum and sampling convention. For example, compare a cell-center temperature with a cell-center value at the corresponding radius. Do not compare a face flux with a cell temperature.
3. State the time convention explicitly. For simulations lasting a day or longer use days throughout the displayed analysis, including early snapshots. Divide native seconds by 86,400. Preserve the original time and rate units in the native files. Specify the year length if converting a published value given in years.
4. Compute absolute error in physical units when the reference may be zero. An illustrative comparison of 101.2 °C against 100.0 °C gives +1.2 °C signed error and 1.2 °C absolute error. Decide pass or fail against the tolerance specified for the study. Avoid percent error against a Celsius datum or a near-zero denominator.
5. For a front position, state the threshold, whether the front must be contiguous, and whether you use an outer edge or cell-center coordinate. For sparse snapshots, report the two bounding times for an event rather than inventing the crossing time.

Publish the comparison basis Keep source title, figure or table identifier, extracted values, unit conversion and mismatch notes with the report. If the source has only a qualitative plot, label the comparison accordingly. An absent reference limits agreement claims even when the solver completed.

RESULTS AND DELIVERY

Explore figures and histories in Results

Open Results and choose the input revision associated with the desired run. Confirm the run identity and available saved times before generating an output. A partial run may offer diagnostic figures with a separate qualification label.

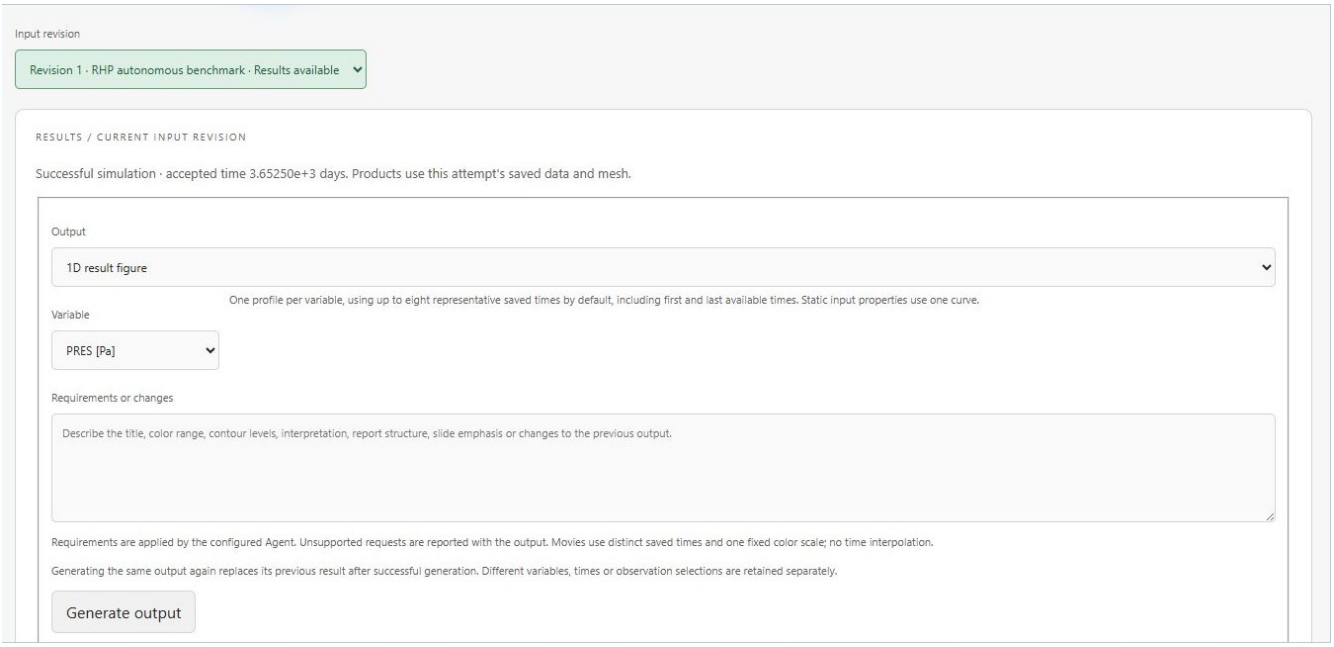


Figure 23. Results exposes the output type, available variable and applicable time or requirements fields for the selected revision.

Model result figure / Section contour figure The field option adapts to dimensionality. Choose a scientific variable and a native saved time where applicable. For a 3D section, choose XY, XZ or YZ and its physical location. Use shared units and state whether a view is cropped.

Model and mesh figures / Computed histories Mesh products show geometry or materials. Computed histories use saved field snapshots. Select the existing product in the output list to open or restyle it. For 1D profiles, the default overlays up to eight representative native times including first and last.

Element history (FOFT) / Connection history (COFT) Use the corresponding native history, select the relevant elements or connections and an available variable. These histories can have a different sampling schedule from the spatial snapshots.

Movie / Documents A movie needs at least three saved times. Engineering report (Word) starts the reviewed reporting workflow. Presentation (PowerPoint) offers slide requirements and a slide count when available.

Select Generate output. Use Find existing outputs, View result, Open folder, Rename, Modify selected figure or Delete as applicable. For a restyle, inspect the selected figure and its recipe, enter the changes, then Apply changes to selected output. Retain the scientific variable, native times and units unless you intend to change them.

RESULTS AND DELIVERY

Plot a field or section and read its axes

Start in Results. Select the input revision associated with the run you want to interpret and confirm that the dataset exposes the expected variables and saved times.

1. For a 1D case choose the field/profile output. Set Variable to temperature, pressure or another available native field. ModelX normally overlays up to eight representative native saved times per variable, covering first and last. A static input property or a single saved time produces one curve. Check axis labels: some radial profiles plot radius vertically.
2. For a 2D field, choose the variable and an available saved time. Confirm axis orientation, units, domain extent, material boundaries and color scale. For an initial/final comparison request one common range. A very small local change may merit a cropped view with stated bounds and a full-domain context figure.
3. For a 3D section, select Section contour figure. Choose XY for constant Z, XZ for constant Y or YZ for constant X. Enter the fixed coordinate in metres within the actual model. For example, Z = −5 m on XY cuts halfway through a block spanning −10 to 0 m. A plane outside the mesh can produce no useful section.
4. Use Requirements or changes for title, variable units, color range, section position or comparison instructions. Choose Generate output, then View result. Confirm that the figure actually intersects the intended domain and uses only available data. Use Custom variable (Agent) for a supported derived or input property and specify the basis.

To restyle Find the existing output by variable, time or filename. Select Modify selected figure, request a specific change and apply it. For example, “Retain the four saved times and variable units. Enlarge the legend and identify the heated cell.” The existing output stays available until replacement succeeds.

To check adopted mesh figures Under the exact revision and job, select Model and mesh figures → View result. In Windows 0.2.0, a full X–Z mesh view can show one outline where fracture and matrix cells share verified geometry. Their native IDs and result values remain separate. Compare the figure with the mesh section of the report.

RESULTS AND DELIVERY

Create histories movies and presentations

Select an output that can answer your engineering question using the sampling available in the native run. A saved spatial field, a native observation history and a movie use different evidence.

Element history (FOFT) Choose the element history output and an available variable. Filter the list by native element name, select the relevant element or elements, then Generate output. Compare curves with shared units. Record which element represents a well, boundary or observation point.

Connection history (COFT) Select the connection history and a quantity present in the native records. Filter by the relevant element or pair and select the connection. Check the connection orientation and native sign convention before interpreting a positive rate as injection or outflow.

Computed histories A snapshot-derived history samples a cell or region only at saved field times. Its curve can be much coarser than FOFT/COFT. Use the displayed product and its recipe to identify how it was assembled. If no native history exists, label the snapshot-derived history explicitly.

Movie A movie needs at least three saved times. Choose a variable that actually changes, state the units and requested scale, generate it and play the saved output. Check the first and last displayed times. The static profile’s eight-time display limit does not determine movie frame selection.

Presentation (PowerPoint) Choose the presentation output, enter Number of slides (1–100), and specify audience and conclusions in Requirements or changes. Choose an optional PPTX template if needed. Its slide masters are retained and sample slides are replaced. Inspect titles, units, figures and qualifications in the exported presentation.

Find and retain products Use Find existing outputs, View result or Open folder. Rename user-facing products descriptively. Inspect the selected filename before Delete. If you need both an original figure and a variant, preserve the original before requesting a replacement.

For example, use a radial temperature profile to locate the heated region, then examine an element’s time history to determine when warming reached that cell. If the first rise lies between native saves, report the interval.

RESULTS AND DELIVERY

Generate a report without rerunning

Start from the accepted run whenever the deliverable is a new interpretation, figure set or report. A report task can reuse existing native results, perform a scientific review and produce a new document without launching the solver.

From Results

1. Open Results and select the revision with the completed run. In Output select Engineering report (Word). Add an available report template if required and enter the audience, comparisons, requested background, figures and limitations under Requirements or changes.
2. Select Generate output. Follow Engineering report status or open the task in Automatic. ModelX checks the retained dataset and original case evidence, selects figures, drafts the report and reviews the export. Use Open report folder when available.

From Automatic

1. Choose Continue an existing simulation → Task to continue. Under Work requested select Redo postprocessing and report only for new analysis or figure selection, or Rewrite the report only for a revised document using existing results/figures. Check the inherited request and give the new task a clear objective.
2. For a delivered source task, Request a new report may also be available. On a partial run, state the accepted interval and ask for diagnostic results. The report should make the remaining scientific limitations explicit.

Delivery checks

Open delivery folder. Open the published Word report and, when available, its rendered PDF. Check that the final page count, figures and reported end time correspond to the intended run. The default for a completed simulation workflow is at least 20 actual rendered pages including figures and tables. A completed multistage chain uses one integrated report. Partial reports scale to the available evidence.

Read the model background, quantitative discussion, benchmark comparison and limitations. A report that misses a requirement can still deliver supported evidence with an explicit qualification. Check the delivery status and page-review receipt if you need to distinguish verified pagination from an estimate.

RESULTS AND DELIVERY

Commission and inspect an engineering report

Use a retained successful or informative partial run. Specify what a reader should be able to establish from the report, then inspect the actual delivery.

1. From Results choose the run's revision, then Engineering report (Word). For a specific house style choose an optional DOCX template. ModelX retains the template content and appends the report. Remove sample prose and placeholder pages from your template beforehand if they should not appear.
2. Alternatively, use Continue an existing simulation in Automatic. Choose Redo postprocessing and report only to select or remake figures. Choose Rewrite the report only to revise prose using available evidence. Match the source task, job and scope before starting.

A ready-to-adapt report request

> "Use the existing accepted run only. Write an English report for a reservoir engineering review. Explain the model background, heating mechanism and boundary assumptions. Compare the radial temperature and saturation fronts with the supplied reference at matched times. Choose complementary figures, state the comparison tolerances and label unavailable evidence. Include limitations and references."

1. Open the delivered Word document and any rendered PDF. Check model, inputs, assumptions, original reference, time convention, result figures and interpretation. An informative discussion explains a measured trend, its physical cause and what the data cannot establish. A long sequence of similar images is insufficient.
2. Cross-check one figure and one quantitative claim against Results and native records. Inspect legends, units, readable text, page count and references in the actual export. Confirm model setup uses a conceptual illustration and a separate computational mesh where supported.

Delivery with limitations An omitted illustration or an unavailable quantitative reference may leave a usable report. Identify the affected section and the supported remainder. A wrong variable, unit or source job warrants correction of the affected claim. For a reporting-only defect reuse the same completed run.

RESULTS AND DELIVERY

Worked example using completed RHP results

This example uses the retained TOUGH3 EOS3 radial heat-pipe calculation. It illustrates how to verify that a report refers to the correct numerical result and adds engineering interpretation.

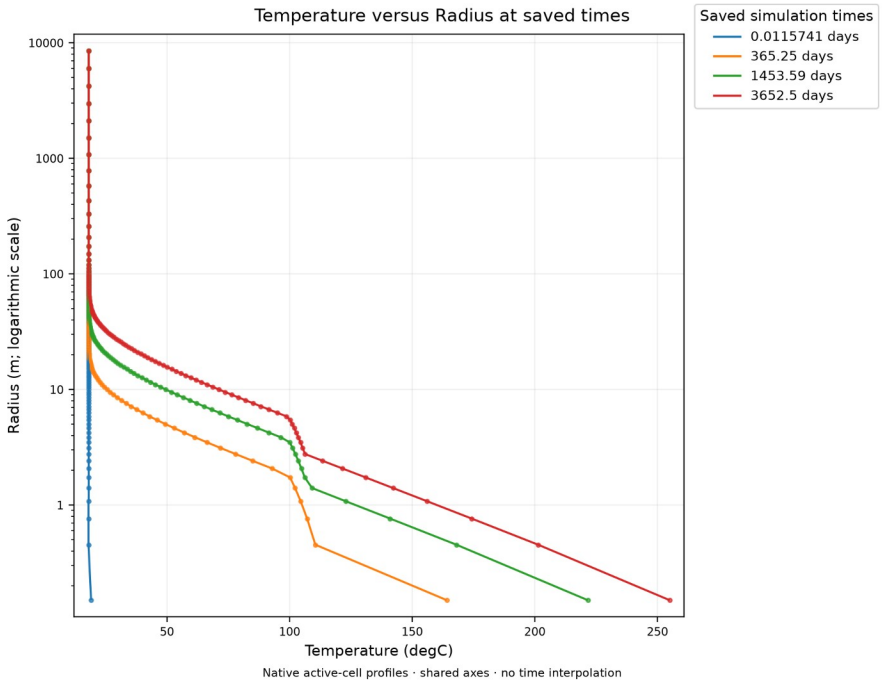


Figure 24. Published RHP temperature profile. The four curves use native saved snapshots. The heated inner rings and nearly unchanged far field share one radial coordinate.

Select the source Use RHP Radial Heat Pipe Qualification and the completed run beginning b14c7abb. Its requested and accepted end times are both 3,652.5 days. The model has 120 annuli and a 3,000 W central heat source. On another workstation, use the corresponding imported or retained run, if available. A new empty workspace has no RHP results.

Set the request Ask for an English engineering report on the completed run, a physical explanation of radial heat-pipe behavior, and comparison with the retained distributed-sample results. Use postprocessing only and let the Agent select figures.

Check the interpretation At the final save, the innermost cell reached 254.97 °C. Cell centers meeting the 1 °C warming threshold extended to 50.22 m, while the contiguous gas-saturation threshold of 0.25 reached 5.03 m. The thermal disturbance extends farther than strong gas enrichment.

Verify the delivery In the reference task the draft grew from 18 to 19 to 22 rendered pages. The final report contained seven figures and six tables. The benchmark matched the gas-enrichment front at rings 5, 10 and 15 at the three matched times. Four snapshots cannot establish the exact times at which those transitions occurred.

RESULTS AND DELIVERY

Work with partial results and delivery records

First select the input revision and attempt whose evidence you intend to use. A completed engineering report, a diagnostic figure and a retained evidence package serve different handover needs.

Select a diagnostic attempt In Results, a Partial run · diagnostic figures entry identifies a specific revision and attempt. Read the stopped time and physical qualification. When published figures are available, open them by caption. If normalization is still loading or has failed, read the message and use Retry loading results when offered.

Choose which work to repeat In Continue an existing simulation, read Inherited simulation requirements, choose the source and check the accepted starting stage. Latest main run and Accepted initialization checkpoint refer to different states. For additional references use Upload supplemental ZIP where offered. Report-only work should point to the result you intend to explain.

Manage output files Use Show more to reveal additional generated outputs. Choose View result to inspect a file, Open folder to locate it, or Rename to give it a meaningful name. Modify selected figure starts from its saved recipe. Cancel modification leaves the selected product available. Check the file before Delete.

Track a report While an engineering report is being prepared, read Engineering report status. Open report folder opens its artifacts. Cancel report stops the report task. A DOCX or PPTX template can be chosen or removed before generation. Inspect the actual exported document and any qualification.

Locate the handover The task card opens the appropriate delivery: a mesh folder, prepared inputs, report, integrated engineering report or project closeout. Expand Troubleshooting and technical details to save an evidence package without simulation when offered. Open the current or previous package and read its Copyable evidence summary. A package inventories retained evidence and can accompany a partial delivery.

REFERENCE

Technical help and local knowledge

Use Technical Q&A for a software question, Management Agent for a particular task, and Knowledge library for reusable observations. Choose the entry point that has the context needed to answer your question.

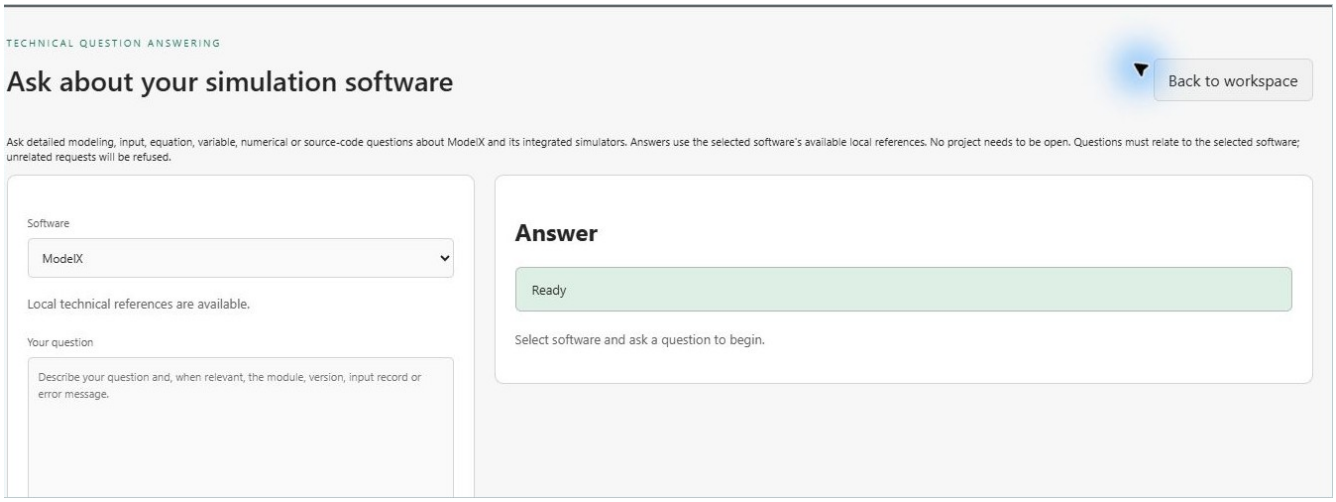


Figure 25. Select a software topic before asking a question. The answer appears beside the question and can be copied for reference.

Technical Q&A Choose ModelX, TOUGH3 or TOUGHREACT in Software. Enter a question tied to that topic, optionally starting from Question examples. Ask Agent submits it. Stop interrupts generation. Copy answer copies a response. New conversation starts another discussion. Back to workspace closes the view.

Knowledge library Open it from Settings or Management Agent. Choose Personal knowledge for reusable notes or Project knowledge for one project. Use New entry and enter the simulator/module/version, observation, explanation, applicability, limitations and tags. Keep unverified hypotheses separate from observed results.

Review and reuse Review the entry, decide whether to allow Agent use, then Save entry. Use Search, Refresh, Import, Export and Copy to personal where applicable. Private notes remain outside Agent context unless permission is granted. Delete entry removes the selected item.

Support and official updates Report a problem opens a draft. Describe the task, expected behavior, observed issue and build. Inspect Diagnostic preview and choose whether to include recent task messages. Save report for offline handoff or explicitly send it through the available signed-in support action. Selecting an update requires the official *.modelx-update.json manifest and matching installer.

REFERENCE

Ask for help and submit a reproducible issue

Use Technical Q&A to understand an application or simulator topic. Use Management Agent when the question depends on the current task. Support can receive a reviewed problem report from the workstation.

Technical Q&A example Set Software to ModelX and ask “Where do I select the saved input revision for a native element history?” For a simulator question, select TOUGH3 or TOUGHREACT and name the EOS, release and native record. Review any cited manual section before applying the answer to a different model.

Management Agent example Open the affected task, read its status and ask “Which native save and source revision support the results in this delivery, and which comparison is still unqualified?” Read How questions affect this task before giving operational guidance. Retain the response with the task.

Knowledge entry In Knowledge library choose the project or personal scope and New entry. Record the symptom, exact simulator/module/release, evidence, successful remedy, verification and limits. Proposed causes remain pending until checked. Save the entry and use Allow Agent use… only if approved. Copy to personal explicitly for a lesson that transfers between projects.

Support report From Settings → Support and official updates or Management Agent choose Report a problem. Enter a concise title, expected behavior, observed behavior, steps and build. Inspect Diagnostic preview, the contact identity and whether to include recent task messages. Native datasets and full logs are not automatically attached.

Offline or online delivery Save the reviewed report as JSON for offline handoff, or confirm the outgoing content to send using the signed-in support action. Retain the returned support reference. If sending fails, retain the local report and record the error before deciding whether to send again.

Install an official Windows fix Finish active work and back up the workspace. Place the official *.modelx-update.json file beside the matching ModelX-Setup installer. Use Select official update…, review the verified release notes, then confirm installation. Reopen About and repeat the failing operation on retained evidence. For the Linux and macOS packages in this edition, follow the native installer instructions in Getting started.

REFERENCE

Diagnose a desktop issue and manage shared notes

When a view fails, first determine whether the issue concerns the desktop, a running task or a native input. Each has a different recovery and sharing route.

Recover one view Use Reopen view to reload the affected surface. Close view or Dismiss notice returns to the surrounding workbench when available. A display failure can leave the underlying job intact. Check its recorded state before deciding to run it again. F11 toggles the desktop full-screen view.

Save local diagnostics Open Troubleshooting and technical details → Preview local diagnostics. Inspect Diagnostic package contents and its SHA-256. Save diagnostic package writes the displayed package locally. Close preview dismisses it. Use the separate Report a problem form if you decide to share a support report.

Review a knowledge entry In Personal knowledge or Project knowledge, select the project where applicable. Search knowledge or choose New entry. Record the observation separately from Proposed explanation / hypothesis, then give the simulator, module, release, evidence and applicability. Use Discard changes to leave the saved entry as it was.

Control Agent access I have reviewed this entry records your verification. Save entry, then explicitly Allow Agent use… if appropriate. Editing the entry requires another review. Disable Agent use stops its use in future calls. Copy to personal creates an independent copy with Agent use off.

Exchange notes deliberately Export… writes the full text of the selected library. Import… brings entries in as pending with Agent use off. Refresh the library and review imported entries individually. Delete entry removes the selected note. For a support ticket, review its own diagnostic preview and decide whether to include recent task messages before saving or sending.

REFERENCE

Troubleshooting by symptom

Start with the smallest check that can explain the symptom. Record the project, revision, task or job identifier and build before changing inputs or installations.

The home page is empty Open Projects and select the study. If the expected library is missing, inspect Settings → Local workspace. A saved workspace change takes effect after restart. Check the original directory before importing another copy.

The task cannot start Check the project and task name, physical description or readable materials, model/module, executable, signed-in account, saved Agent connection and sharing permission. Complete any specific information request shown in the task.

Run inputs is disabled Select a revision with native files and resolve unsaved edits. Register an executable matching the software/module. Choose supported parallel settings and a valid core/process combination. Read the audit results after submitting the run.

Parallel launch fails Check the executable path and the MPI or OpenMP capability reported for that binary. Verify required runtime libraries and launcher availability. Read terminal output for process errors and native output for simulation errors.

Mesh or restart is rejected Check total cells including boundaries, geometry units, element ordering, source labels, mesh-to-INCON mapping and EOS compatibility. For reactive work verify the chemical restart/database as well. Preserve original files while correcting the revision.

A plot or history is missing Select the exact job/revision. Inspect available variables and saved times. Check whether you requested native FOFT/COFT before the run or need a snapshot-derived history instead. For a diagnostic run, inspect the published figures in its report folder.

The report is short or lacks a comparison Confirm the source job reached the requested horizon, review the actual rendered document and its qualifications, and attach the intended comparison data. Request a postprocessing or report-only task from that run with specific evidence-backed requirements.

The problem persists Open Management Agent or Settings → Report a problem. Include the reproducible steps, exact error, build, task stage and what can still be delivered. Review the preview before sharing. Keep working native data and project backups locally.

REFERENCE

Complete a training study from start to handover

Use this exercise to check a newly configured workstation. First complete the mesh exercise. Then use a small documented model for input preparation and execution. The RHP walkthrough earlier in this guide illustrates how to inspect a completed run.

1. Record the ModelX build and workspace. In a project called “Training grid” make the 100-cell Cartesian block described in the mesh chapter. Inspect the counts, rock label and total volume. Accept the mesh and complete a mesh-only delivery. This establishes a geometry baseline without inventing any flow or heat properties.
2. Start a separate engineering project for a documented case. Upload the physical description, parameter tables and independent reference figure. If the case uses the training geometry, reuse its verified MESH by selecting it in that project. For RHP use the documented radial geometry. A rectangular training grid cannot reproduce a radial benchmark.
3. Choose Prepare inputs only and give the Agent the required source, boundary, initial condition and output specifications. Open the delivered revision. Verify the mesh matches the intended case, the source appears in its documented element, and the native input audit has no unresolved blocking errors.
4. For manual operation select the prepared revision under Runs → Direct run. Select an eligible executable and supported core count, then Run inputs. For an independent full-workflow exercise, use a separate Prepare, simulate and deliver task and let the Agent prepare, run, review and report. Label the two jobs distinctly if comparing them.
5. Read the native final time, saved-time coverage and source magnitude. In Results generate a changing field profile and inspect the available observations. For a reference comparison use the same coordinates, variable definitions, units and times as the governing case.
6. Request a new report from retained results. Verify the delivery folder, source job ID, key values, figures and stated limitations. Archive the workspace or export inputs according to the handover need. Record who supplied the acceptance criteria and which checks the operator actually performed.

Completion record Keep the project and task names, build, simulator/module, revision/job ID, mesh cell count and hash, accepted interval, comparison result, report location, remaining limitations and any manual decision. This record lets another operator repeat the check.

REFERENCE

Run a self contained EOS3 practice case

Use this fully specified exercise when you have a registered TOUGH3 EOS3 executable and no benchmark files. It tests installation, preparation, execution and interpretation of a uniform equilibrium state. The values and pass criteria below are training specifications.

1. Create a new training project, open Automatic, select TOUGH3 / EOS3 and choose Prepare, simulate and deliver. Name the task “EOS3 closed uniform slab”. Select Explicit direct transient start. Enter the following in Model request.

   “Create a horizontal XY domain 20 m × 10 m, thickness 2 m, with a uniform 4 × 2 grid and one vertical cell. Use a homogeneous isotropic rock ROCK1 with porosity 0.20, permeability 1×10^{-13} m², grain density 2,600 kg/m³, specific heat 900 J/(kg K) and thermal conductivity 2 W/(m K). Set gravity to zero. Use zero capillary pressure and linear liquid and gas relative permeabilities with zero residual saturations. Use TOUGH3 EOS3 air and water in two-phase equilibrium throughout, initially at 100,000 Pa, 20 °C and gas saturation 0.20. All exterior faces are closed and insulated. There are no sources or sinks. Run for one day. Request spatial output at 0.25, 0.5 and 1 day and retain the initial condition. Document the actual native primary-variable encoding, functions and saved times.”

2. Add the acceptance criteria below to the request and start the task. Check the native input audit, especially the phase-state representation and type of pressure variable used. Report any unavailable saved time explicitly. For a manual exercise choose Prepare inputs only first and then run the published revision from Runs.

Geometry check Expect eight active cells, ten internal connections, volume 50 m³ per cell and total volume 400 m³. Each footprint is 5 × 5 m. With closed external faces this exercise does not call for extra boundary elements.

Physical check At the final save, require every cell to remain within 10 Pa, 0.01 °C and 0.0001 gas saturation of its initial value; require the solver to reach 86,400 s (1 day). These educational tolerances are specific to this zero-forcing exercise. A uniform field is the intended result. Summarize the ranges in text and retain the audit, job and native evidence.

Scope of this exercise The counts and equilibrium response are analytical expectations. Passing checks the selected installation and workflow on a stationary case. The RHP example exercises changing fields and benchmark comparisons.

REFERENCE

Find a feature by workbench area

Use the linked entries to go directly to the operating instructions. Individual commands also appear under their task in the contents.

Projects and revisions Create, import, export or delete a project’s inputs and locate the workspace.

Settings and first use Choose appearance and workspace. Reach account, simulator and AI setup.

Accounts and AI connections Choose account login, an API model, a compatible gateway, local service or trial. Test the default connection and control material sharing.

Simulator Management Register an executable and its parallel mode, choose the module default, and attach source and reference materials. Compilation has a separate tab.

Automatic Choose a workflow mode, materials, optional mesh, initial state and task requirements. Follow the active job and its deliveries.

Mesh generation and import Reuse native MESH, convert an external grid, or design a new Cartesian, radial or irregular footprint.

Model Edit native files, ask for an edit, interpret audit findings and save a new revision.

Runs Choose Direct or Intelligent run and compatible CPU settings. Inspect terminal and native output.

Results Select a field, section, mesh, native or computed history, movie, Word report or PowerPoint presentation.

Management Agent Inspect status, ask a task-specific question, choose recovery, apply a correction or close out available work.

Technical Q&A and knowledge Ask about the selected software and retain reviewed personal or project knowledge.

Diagnostics and support Recover a view, inspect a local diagnostic package, or prepare a separate report for support.

STUDY HANDOVER

Closing remarks

ModelX uses an LLM to carry a reservoir simulation study from model definition to a reviewed engineering report. The engineer frames the question and decides what evidence would answer it. The Agent can then build the mesh, prepare and check native inputs, run the simulator, investigate recoverable failures and turn the saved results into figures and an interpretation.

Return to the question that started the study

In the radial heat-pipe example, the final profiles show how much farther warming extends than strong gas enrichment. Those distances answer the original physical question. The four saved snapshots bracket the transition but leave its exact time uncertain. When handing over your own study, identify the result that supports the decision and explain where the evidence runs out.

Make the conclusion reproducible

Keep the ModelX build, simulator module, input revision and run identifier with the report. Check a decisive figure against Results for that run, including units, location and saved time. For a continuation, identify the preceding restart. For a partial run, state the last accepted time. A colleague can then trace the interpretation to the calculation and use the same results to answer a follow-up question.

Measure the time returned to engineering

ModelX aims to increase engineering productivity by more than 90%. Compare studies with equivalent scope, deliverables and acceptance criteria, and count the hands-on engineer-hours from the initial brief through final review. Reusing an accepted mesh, recovering a run or revising a report from saved results can all save manual work. The practical gain is time the engineer can give back to evaluating assumptions, comparing scenarios and deciding what the reservoir response means.