

APRIL 2024



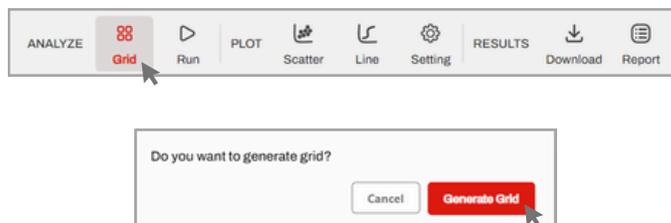
Pmass Manual

Simulation

www.pmass.io

Grid Generator

To generate a peridynamic grid for your current project in Pmass, click on the Grid button. This action will trigger a pop-up window to appear. In the pop-up window, confirm your choice by clicking a button labeled "Generate Grid". Once confirmed, Pmass will begin processing the peridynamic grid using the project's current settings and parameters. The grid generation process may take some time depending on the complexity of the model and the computational resources available. Once the grid is ready, the project status will be updated and you can scatter the grid using online post-processing tools.



The process of generating a peridynamic grid in Pmass is a crucial phase in the pre-processing of your simulation project, ensuring that the model is accurately set up for the analysis. Here's a detailed explanation of how grid generation works in Pmass:

1. Placement of Peridynamic Points:

- The grid generation begins by placing peridynamic points into each part based on the grid setup defined for that part.

2. Material Assignment:

- Initially, each point is assigned the material of the part it is located in. However, if a point falls within an inclusion, it adopts the material properties of that inclusion instead. This feature allows for the simulation of complex materials with varying properties within a single part.

3. Handling Voids:

- During grid generation, the system checks whether a point is inside a void (or hole). If a point is found inside a designated void area, it is removed from the grid. This step is essential for accurately modeling parts with empty spaces or removed sections.

4. Assignment of Special Properties:

- The grid generation process also involves checking whether points fall within specific areas designated as boundary conditions, no-failure zones, or output zones.
- Points within a boundary condition area have specific interactions and constraints applied to them.
- Points within no-failure zones are exempt from failure criteria checks, ensuring they remain intact regardless of the stress conditions applied.
- Output zones are areas where detailed data collection occurs, providing critical information for post-processing like stress distribution and deformation.

5. AWS Lambda Function:

- Pmass utilizes AWS Lambda to perform grid generation, leveraging cloud computing to handle this computationally intensive process efficiently. The use of AWS Lambda ensures that grid generation is fast and scalable, capable of handling complex simulations without requiring extensive local computational resources.
- Importantly, you are not billed for grid generation despite using cloud resources, which is a significant benefit, making this process cost-effective for users.

Run

Setting up and running a new simulation in Pmass involves a few critical steps, particularly when managing computational resources and optimizing run times. To initiate a new simulation run for your project, click on the **Run** button on the Controlbar to open the simulation setting panel. The simulation setting panel is divided into two sections, each designed to help you efficiently set up and estimate the requirements for your simulation run:

Run Simulation	
Run Name	run0
Comp. Resource	c4.4xlarge
Run Estimator	
Time (Preprocessing)	280 (s)
Time (Per Increment)	70 (s)
Required Memory	14 (GB)
<input type="button" value="Cancel"/> <input type="button" value="Run"/>	

Run Simulation Section

- **Run Name:** Assign a unique name for your simulation run. This helps in identifying and managing multiple runs within the same project.
- **Comp. Resources:**
 - Select an AWS EC2 instance type from a list that is compatible with your current plan. This choice will determine the computational power available for your simulation.
 - If the required resources exceed what your current plan offers, consider contacting support to discuss upgrading your plan for additional computational power.

Run Estimator Section

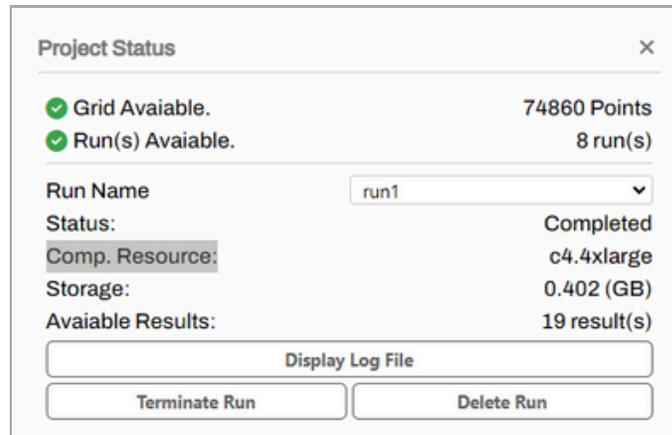
- This tool provides estimates on the time and memory requirements based on your input settings, grid size, and the selected computational resources.
- Key Estimates:
 - Required Memory: Ensure that the required memory does not exceed the memory capacity of the selected AWS EC2 instance.
 - Pre-processing Time: Includes time needed for tasks like forming the family of points which is crucial for peridynamic calculations.
 - Increment Loading Time: Estimated time to perform each loading increment.
 - Total Simulation Time: Calculate by multiplying the time per increment by the number of increments and adding the time required for preprocessing.

Initiating the Simulation

- Start the Simulation:
 - Once all settings are confirmed and you've reviewed the estimates, click on the **Run** button within the setting panel.
 - A pop-up window will appear to confirm your decision:
 - Click "**Proceed**" if you are ready to start the simulation.
 - Click "**Cancel**" if you wish to review or change any settings.
- Handling Conflicts:
 - If a run with the same name already exists, you'll be warned that proceeding will replace the existing results with new ones. Ensure you are ready to overwrite any existing data.
 - If you've reached the maximum computational or storage limit of your plan, you will receive a warning, and you won't be able to submit the run until you upgrade your plan or adjust your resource usage.

Status

The Project Status feature in Pmass is a critical component for monitoring and managing your simulation projects. It provides comprehensive details about the current state of your project, including grid data, runs, and individual run statuses. To access and utilize this feature effectively, click on the **Status** button located on the Controlbar. This action will trigger a pop-up window that displays the overall status of your project.



Understanding the Details in the Project Status Window

- **Grid Status:** Shows whether a grid is available. If available, it will display the number of points in the grid, giving you a sense of the complexity and scale of the simulation setup.
- **Runs:** Indicates whether any runs are available and displays the total number of runs associated with the current project.
- **Detailed Run Information:** To see detailed information for a specific run, select the desired run from the Run Name dropdown menu. The following details will then be displayed for that run:
 - **Status:**
 - **Initializing:** The dedicated EC2 instance is setting up, with necessary tools being installed.
 - **Running:** The Pmass Engine code is actively running on the EC2 instance.
 - **Completed:** Indicates the simulation has finished successfully.
 - **Crashed:** The simulation has stopped unexpectedly with an error code; the EC2 machine has been stopped.
 - **Terminated:** The simulation was manually terminated by the user.
 - **Comp. Resource:** Displays the type of AWS EC2 instance used for the run.
 - **Storage:** Shows the total storage used by the solution files for this run.
 - **Available Results:** Lists how many solution results are currently available for this simulation.

Additional Functionalities

- **Display Log File:**
 - Click on the **Display Log File** button to view the current progress of your simulation or to diagnose issues, especially useful if the simulation has crashed. The last line of the log file often contains the error code that can help identify the problem.
- **Terminate Run:**
 - This option is available if the run status is either Initializing or Running. Terminating a run can save time and resources, particularly if preliminary results indicate that continuing is unnecessary or if the design needs adjustment.
- **Delete Run:**
 - Use this option to permanently delete all data and results associated with a run. Be cautious with this action as it is irreversible and can result in the loss of significant data.

By using the Project Status feature in Pmass, you can efficiently manage your simulation projects, track their progress, and make informed decisions based on real-time data and results. This tool is invaluable for ensuring that your simulations are running smoothly and for intervening promptly when issues arise.