

# User Oriented Advancements in MOOSE-Workbench

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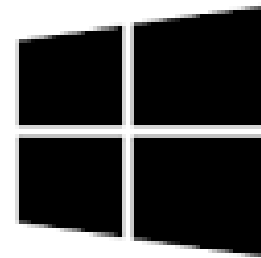
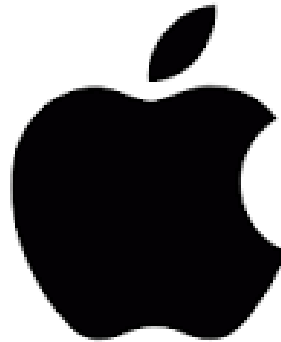


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# ***NEAMS Workbench Mission Statement***

Provide a cross-platform graphical user interface (GUI) designed to facilitate problem creation, modification, navigation, validation, and visualization, as well as output and data file interaction as needed by new and experienced users.



Latest release available at <https://code.ornl.gov/neams-workbench/downloads>



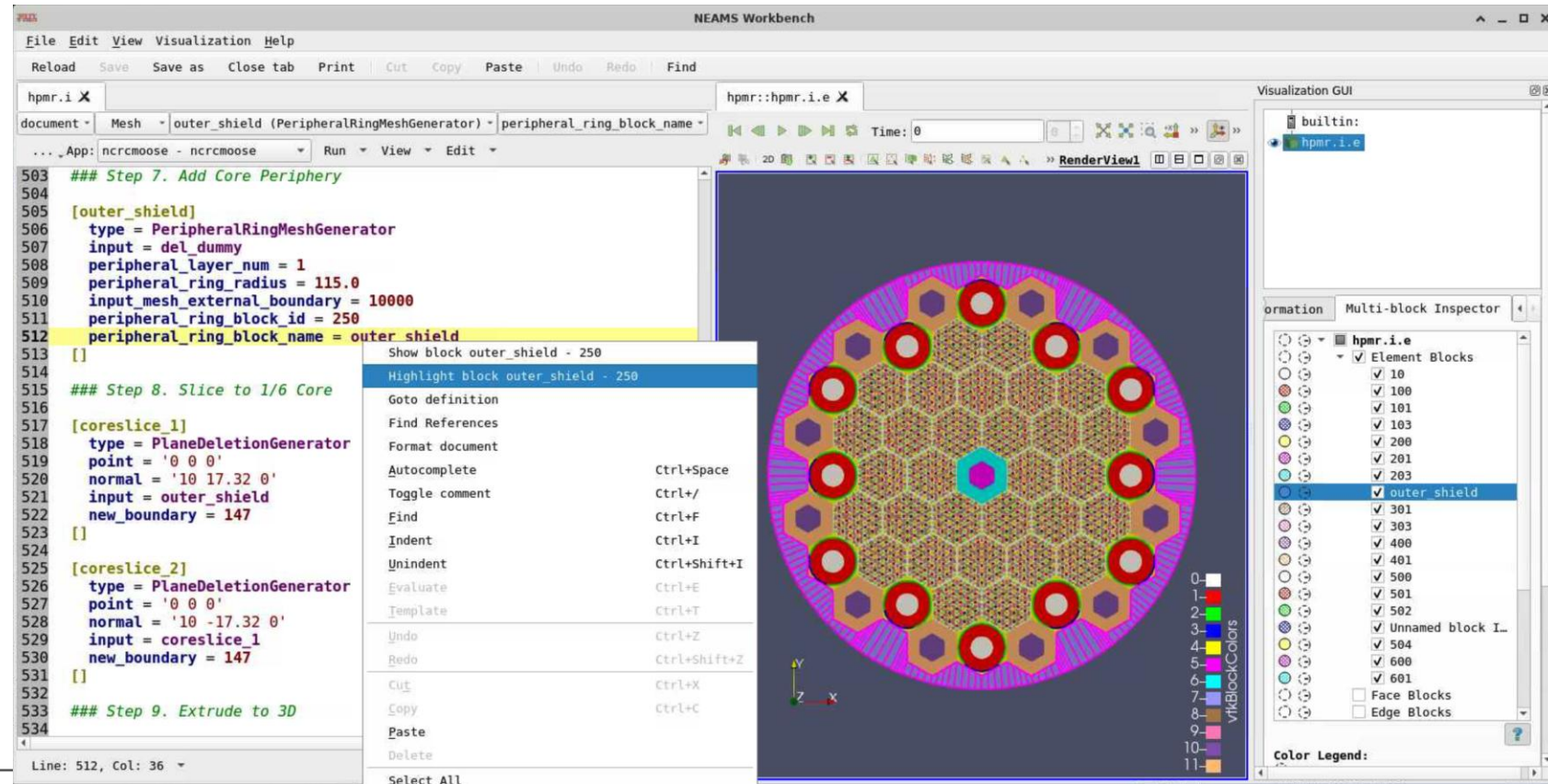
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# NEAMS Workbench

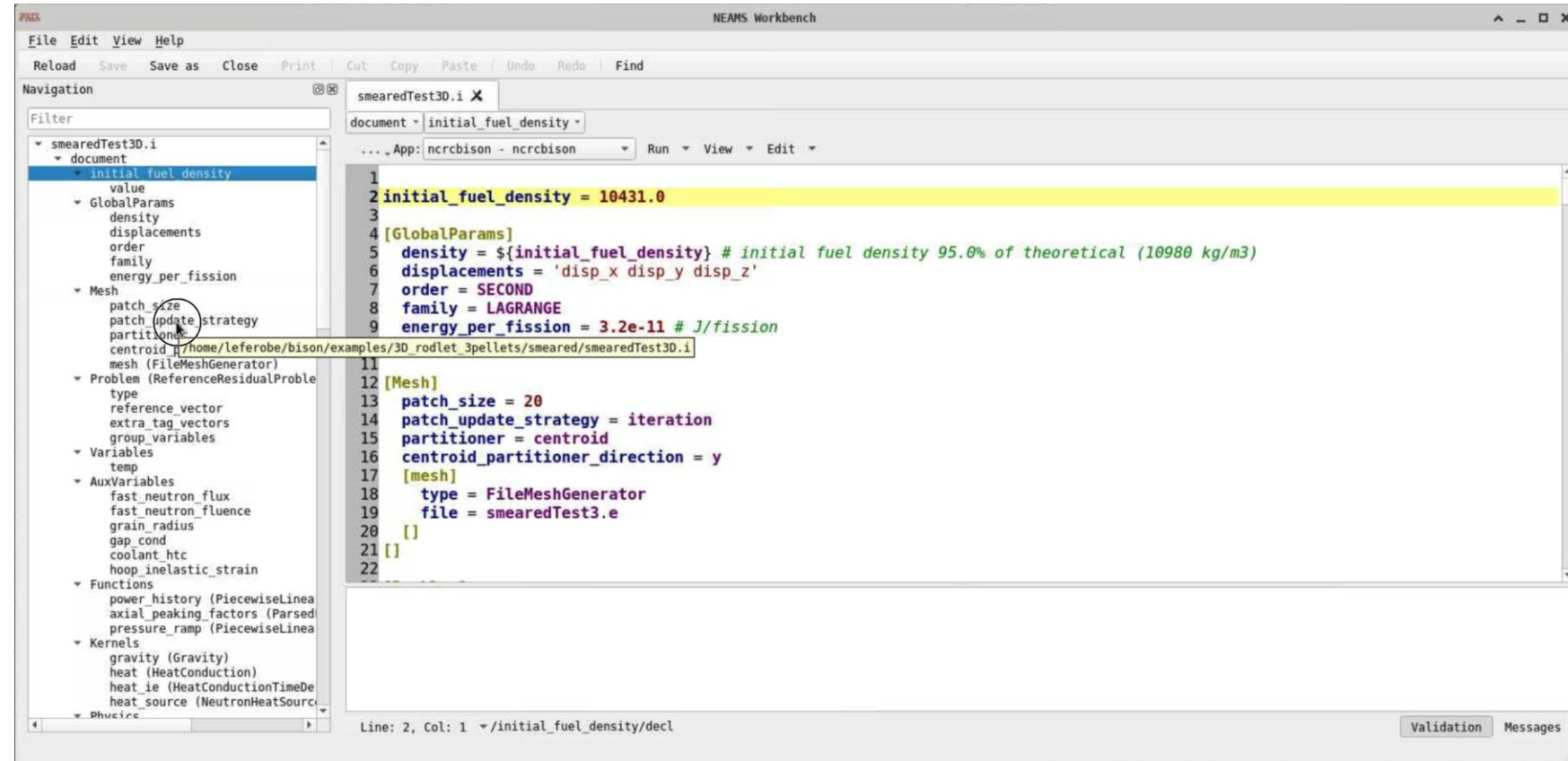
*An integrated environment for streamlining NEAMS users' tool interactions and workflows*

- Advanced input editor for problem creation and review
- Application runtime for local and remote job launch
- Integrated visualization capabilities for input verification and output analysis



# Advanced Input Editor and MOOSE Language Server

- Syntax highlights
- Customizable run configurations for job launch
- Document quick-navigation
- Synchronized editors
- Cursor context and on-hover documentation
- Context aware input autocompletion
- Automatic input checking
- Input definition and reference navigation
- Integrated mesh interactions and input visualization



# Application Runtime for Local and Remote Job Launch

- NEAMS Workbench is available on INL's HPC Nuclear Computation Resource Center (NCRC) with application configuration in 3-clicks
- Local configuration of any supported Application in 4-clicks
- Remote job launch from PC to cluster

The screenshot displays the INL HPC OnDemand web interface. The top navigation bar includes links for Files, Jobs, Clusters, Interactive Apps, Information, NCRC, Training, and My Interactive Sessions. The main content area is divided into two panels. The left panel, titled 'Local configurations', shows a table of applications with columns for Name and Description. The table lists five applications: nrcrbison, nrcrbluecrab, nrcrgriffin, nrcrpronghorn, and nrcrsam. The 'nrcrbluecrab' application is highlighted. Below the table, a message states 'nrcrbluecrab is now activated. Use File > Open or drag-n-drop inputs'. An 'Activate' button is present. A terminal window at the bottom shows the command history for activating the application. The right panel, titled 'Home / My Interactive Sessions', shows a list of interactive apps: Desktops, Linux Desktop, Linux Desktop with Visualization, IDE, Visual Studio Code Server, Jupyter, and Jupyter. A red box highlights the 'NCRC' section, which includes 'GUIs' and 'NEAMS Workbench'. Another red box highlights the 'NEAMS Workbench' option in the 'Interactive Apps' list.

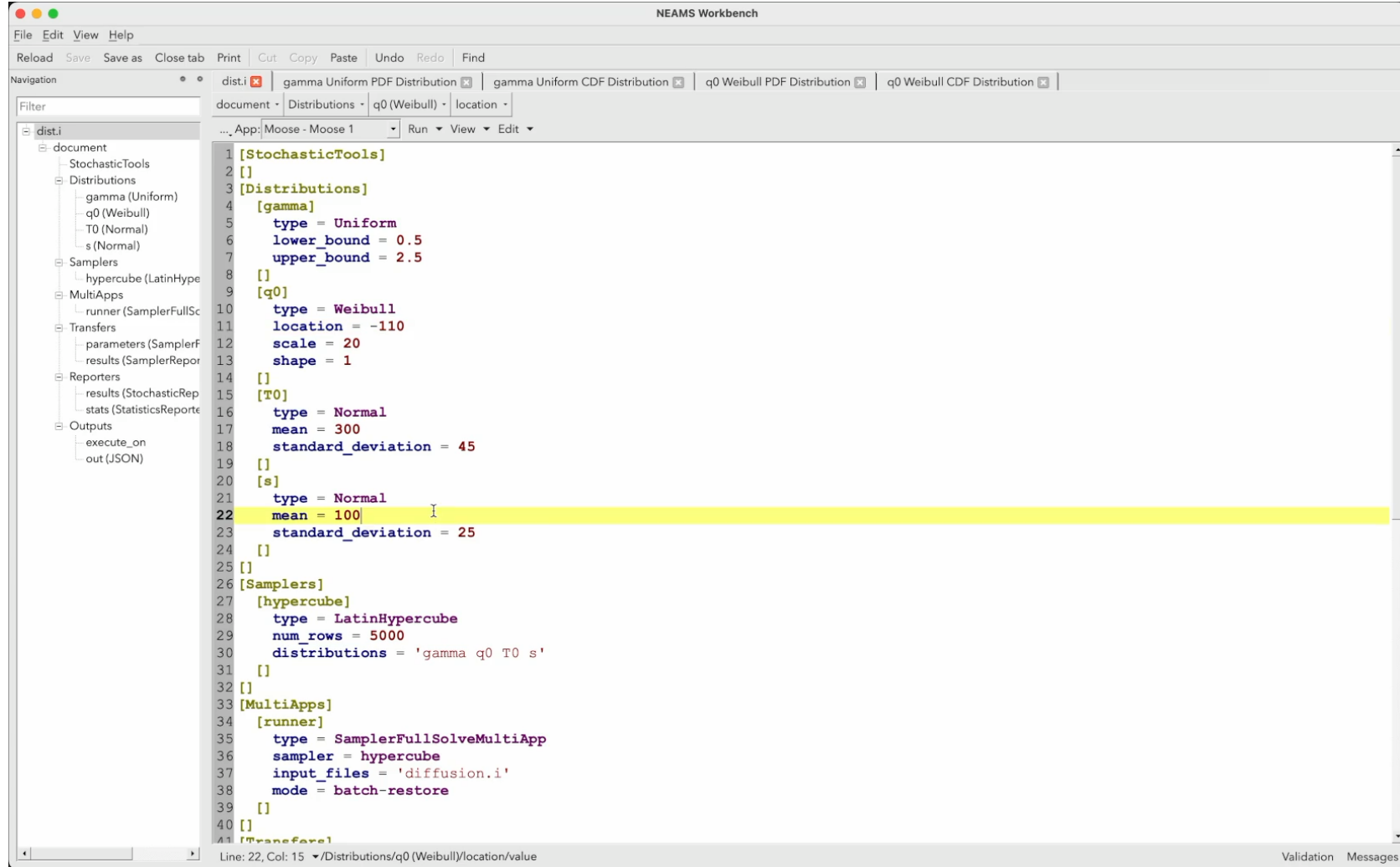
| Name            | Description                                                                                                                                                                           |
|-----------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1 nrcrbison     | Built on top of MOOSE, which solves partial differential equations (PDEs) important to fuel performance via finite element (energy conservation, stress divergence, and species mi... |
| 2 nrcrbluecrab  | The Comprehensive Reactor Analysis Bundle (CRAB or alternately BlueCRAB) described in this report can be used for safety analysis of all reactor designs, both light water            |
| 3 nrcrgriffin   | a finite element-based reactor multiphysics application. It is suitable for steady state and time-dependent coupled neutronics calculations                                           |
| 4 nrcrpronghorn | Pronghorn is a multi-dimensional, coarse-mesh, thermal-hydraulics (TH) code for advanced reactors. It serves the intermediate fidelity realm situated between detailed co...          |
| 5 nrcrsam       | System Analysis Module (SAM) is a fast-running, whole-plant transient analysis code with improved-fidelity capability for fast turnaround design scoping and safety analyse...        |

```
Mon May 2 09:23:57 2022 X
24
25 Completed writing server Python script: /home/delcmarc/.workbench/apps/nrcrbluecrab_server.py
26
27 Completed writing the class file at /home/delcmarc/.workbench/nrcrbluecrab.py
28
29 Reloading nrcrbluecrab module...
30
31 Attempting to download the options file
32
33 Executing remotely '/apps/local/neams/Workbench-4.1.2/rte/entry.sh /apps/local/neams/Workbench-4.1.2/rte/blue_crab.py -json'
34
35 Completed downloading the options file at /home/delcmarc/.workbench/apps/nrcrbluecrab/options/nrcrbluecrab.json
36
37 {"Completed": true}
38 Process finished with 0 return code; ran in 0 secs, finished at Mon May 2 09:23:58 2022
```



# Integrated Visualization capabilities for input and output

- Interactive data plots of input and output
- Interactive mesh visualization of input and output via integrated ParaView visualization and analysis toolkit



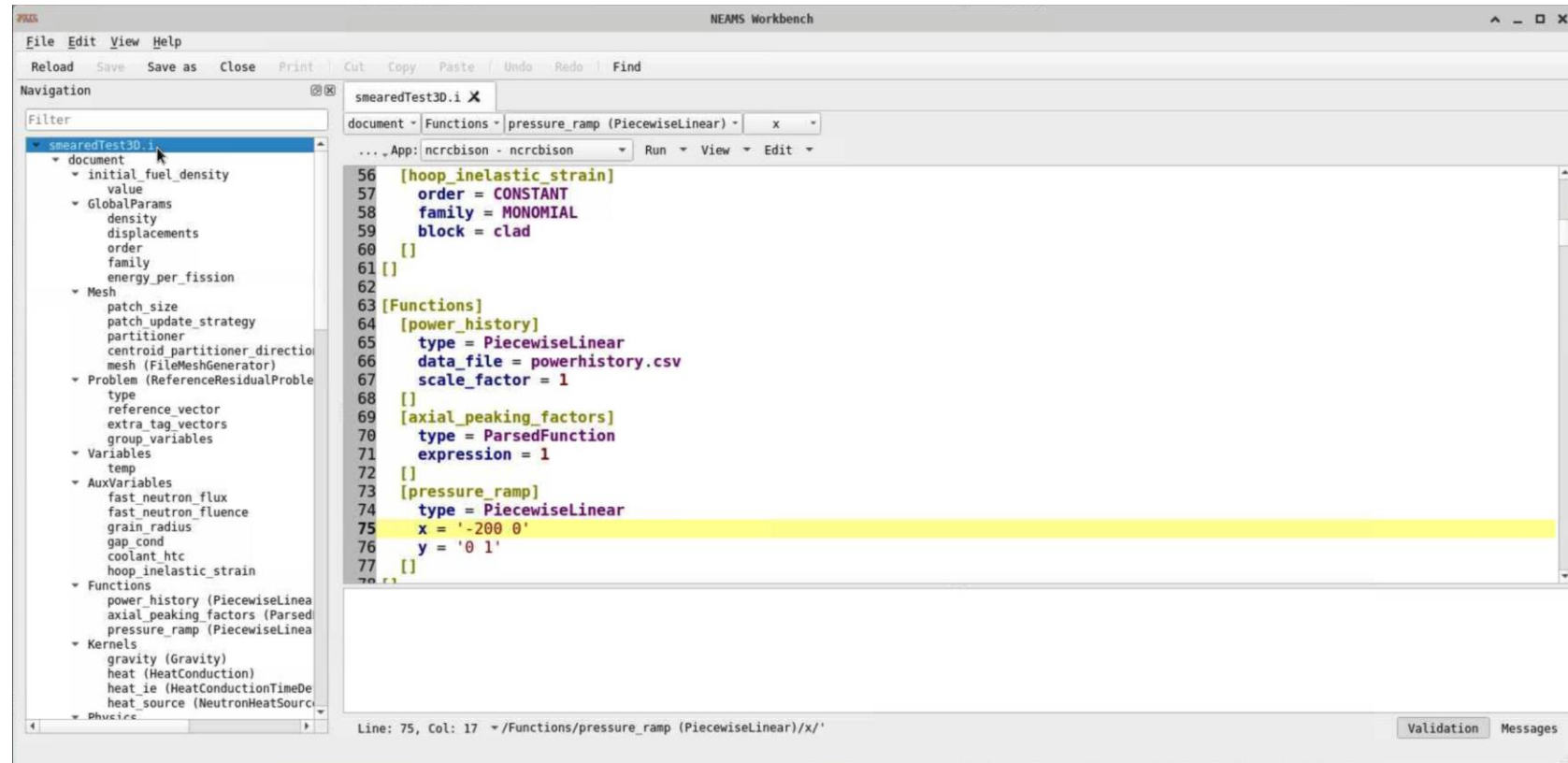
```
1 [StochasticTools]
2 []
3 [Distributions]
4 [gamma]
5   type = Uniform
6   lower_bound = 0.5
7   upper_bound = 2.5
8 []
9 [q0]
10  type = Weibull
11  location = -110
12  scale = 20
13  shape = 1
14 []
15 [T0]
16  type = Normal
17  mean = 300
18  standard_deviation = 45
19 []
20 [s]
21  type = Normal
22  mean = 100
23  standard_deviation = 25
24 []
25 []
26 [Samplers]
27 [hypercube]
28   type = LatinHypercube
29   num_rows = 5000
30   distributions = 'gamma q0 T0 s'
31 []
32 []
33 [MultiApps]
34 [runner]
35   type = SamplerFullSolveMultiApp
36   sampler = hypercube
37   input_files = 'diffusion.i'
38   mode = batch-restore
39 []
40 []
41 [Transfers]
```

Line: 22, Col: 15 | Distributions/q0 (Weibull)/location/value



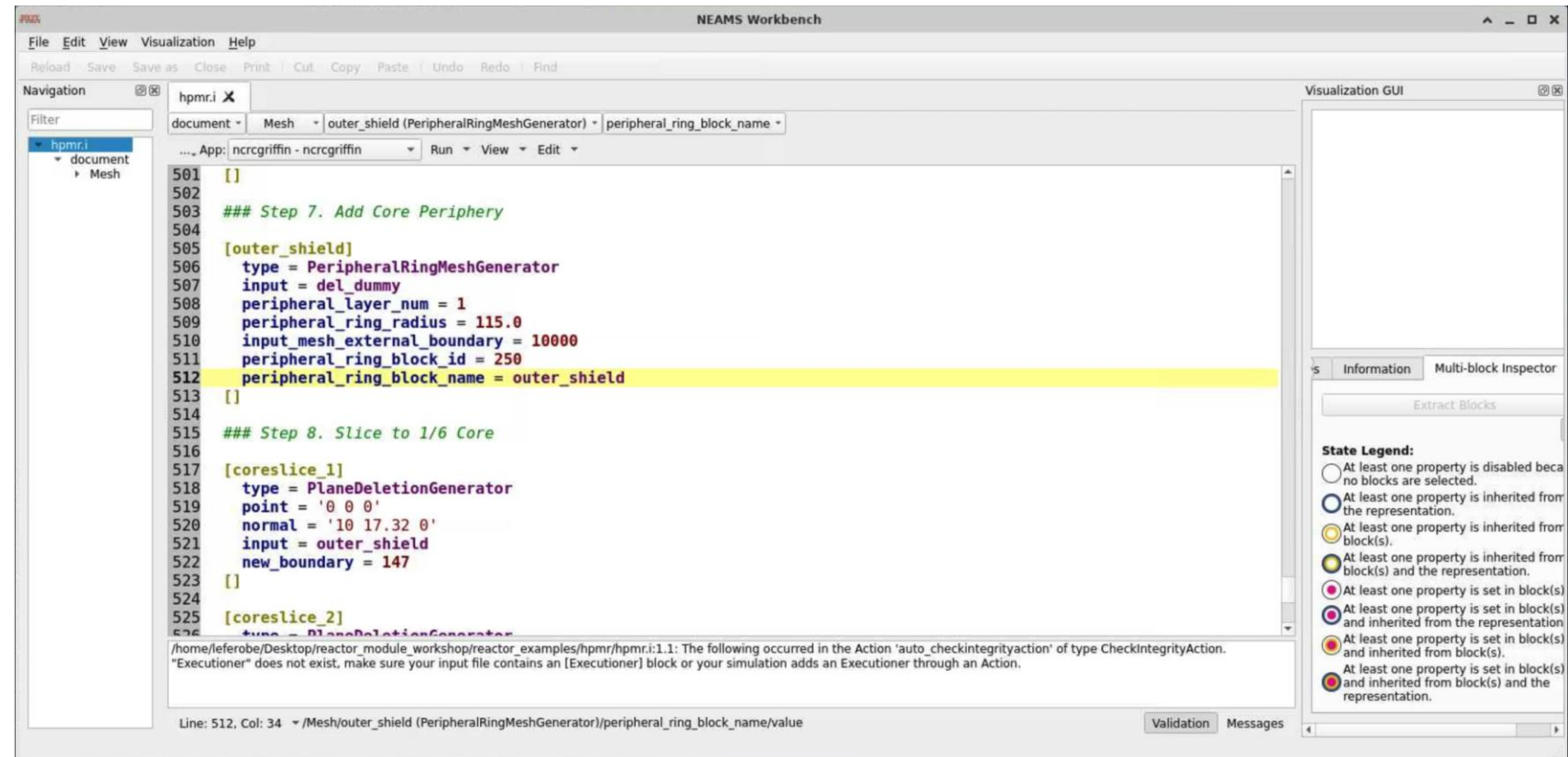
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# Summary

- Advanced input editor for problem creation and review
  - Ongoing work to facilitate exposing MOOSE Action results to MOOSE Language Server and NEAMS Workbench user
  - Preparation for integration of generative AI
- Application runtime for local and remote job launch
  - Additional scheduler integration and job controls for cross-session interactions
- Integrated visualization capabilities for input verification and output analysis
  - Additional input and output data visualizations specifically related to MOOSE Stochastic Tools Module

Checkout the NEAMS Workbench Virtual Test Bed (VTB) Tutorial

[https://mooseframework.inl.gov/virtual\\_test\\_bed/vtb\\_tutorials/neams-workbench.html](https://mooseframework.inl.gov/virtual_test_bed/vtb_tutorials/neams-workbench.html)





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