Profiling Tutorial #3

Using ProfVis - GUI Features
Outline:

ProfVis GUI reference:

- All the features of the GUI and a reference for future.
- Examples of things to look out for.
ProfVis GUI Features
Looking at your results:

There are a few ways to alter your view of the data:

- **Scale (1x, 2x, 3x)**

  Zoom. Especially useful when you are working with a small number of processors or a large number of quick regions over a long simulation time. “Long, skinny data set.”

- **Levels - Used in Profiling PlotFiles**

  Profiling data has levels, same as AMRVIs plotfiles. Can zoom into deeper levels to obtain finer results / the data set.

  For most profiling data, levels are visualized using ‘`stride`’.
Each color corresponds to a different region.

Each region can appear multiple times, but will appear the same number of times on each rank.

Regions are identified by type and the instance of that type. (e.g. 3rd call of the 5th unique region called.)

Currently based on computational rank 0. (Will be variable in the future.)
Subregions Example: [Ctrl-S]

Used in Profvis to filter your analysis time to an absolute minimum and maximum across all MPI ranks.

If you select this region (left click & drag), then subregion...

...you will end up with this new ProfVis window.

Note the ‘legend’ times are different.

Analyses will now be limited to within this new time window for all MPI ranks.

(This is the ‘highest’ level parse. Think of it as the “first” filter step.)
ProfVis Window: Select your regions

Right Click: Add region

Middle Button: Remove region

Left click and drag: Select a time range. (Slicing).

Left click: Get info about the selected region in the amrvis command window.
Regions:

Turning regions on and off turns them off relative to the time of the selected region, (Entire matching vertical block).

Although not displayed, the selected time region for each MPI rank will be based on the local time of the matching region. Can be seen in stdout when "Generate Func List" is clicked if interested. Look for:

"filterTimeRanges[rank][time block] = [##, ##]".

The exact time for each rank **should not match**. It will include the time for the selected regions on all ranks.
Prior to clicking on “Generate Function List”, it provides a simple overview similar to that provided by TINYPROFILER.

- (Does not require parsing through the profiling database. VERY quick, even for large databases.)

After clicking on “Generate Function List”, it is more exact data from the full database information.

The function list results will filter based on both the subregion and the selected regions.
Function List: What to Look Out For

- Top time consuming functions and total percent spent in them.
- Functions that you wouldn’t expect to be called.
- Very high number of calls.
- Very high standard deviation or coefficient of variation.
Function Plot:

Click on a function in the function list to get a plot of the amount of time each MPI rank spent in that function.

Function time (sec)

Left click to recenter plot.
Left click & drag to zoom to box.
Right click to reset the view.

Can plot multiple functions on a single plot. Turn on and off by left clicking on the function.

In the future, will be able to export the time/rank data for your own processing.
(No output formatting options setup yet for Profvis.)

BEWARE the time axes!!! Will scale based on the min/max time of the selected functions, so can be misleading.
Select regions of interest and click on “Generate Region Time Plot” to make a plot of total time in the selected regions for each MPI.

Left click to recenter plot.
Left click & drag to zoom to box.
Right click to reset the view.

Can plot multiple functions on a single plot. Turn on and off by left clicking on the function.

In the future, will be able to export the time/rank data for your own processing.
(No output formatting options setup yet for Profvis.)

BEWARE the time axes!!! Will scale based on the min/max time of the selected functions, so can be misleading.
Function Plot & Region Time Plot:
What to look out for

★ Very large range of runtimes.
★ Single / small number of MPI ranks that are doing all the work.
★ Unexpected patterns of work.
Timeline Plotfile:

"Generate Timeline" creates a plot of MPI calls for each process over time, giving a picture of the communications across your application.

- Extremely useful to visualize your communication and find bottlenecks.
- Parses based on slicing but not regions (would leave giant blank areas between regions.)
- Currently, the time is incorrect in sliced timelines, but the chart is still accurate.
Timeline Plotfile: Call trace

Open with “View...Call Trace”.

Click and drag to select a region.

Ctrl - Left Click and drag to select a box that covers all processors (vertical box).

Useless for a call trace, but: Shift - Left Click and drag to select all time (horizontal box).

Displays entire call trace history in the box and start time of that call.

Arrows denote location at the end of the box. (Everything below was ran and exited.)
Timeline Plotfile: What to Look Out For

- Large barriers or MPI calls waiting for results.
- Blocks of MPI calls (suggesting processors are waiting.)
- Non-structured communication patterns that can be improved.

Colors / legend can be confusing.

Be sure to double check what’s what by looking at the data set.
Send/Recv List:

Detailed list of all point-to-point MPI calls, sorted chronologically.

Lists in chronological order:

- Time of function call
- Type of MPI function call
- From rank
- To rank
- Size of the message
- Message tag
- Regions that the call occurred within.

Filtered by both subregions and region selection.

Specially made for MPI analysis for Cy Chan’s research group.

If you can parse the data yourself, feel free to use it in your own studies. If you need a different version of something similar, let me know.
Sends Plotfile:

Creates plot file describing the total number of MPI point-to-point sends and the total size of messages between each pair or MPI ranks.

Use the “Variable” drop-down menu to switch between:
- number of calls (totalSendsP2P)
- total message size in bytes (totalSentDataP2P)

Currently, building a Sends plotfile in the GUI only works in a serial build of AMRVis.

However, the serial version will properly filter over subregions and regions.
Sends Plotfile: What to look out for

➢ Hotspots in data sent or number of calls.
➢ Extremely asymmetric plots; all the data is going one-way.
➢ Procs with no communication at all; black columns or rows.
➢ More ‘far away’ communication than ‘nearby’ communication; biggest contributions are away from the diagonal.
For Profiling Help Contact:

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