



# Trace Compass Scalability Update

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# Agenda

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- ① Background
- ② History Tile Backend
- ③ Experiments
- ④ Results

# Background

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- Trace Compass State System Backend:
  - Middle layer storing the analysis results
  - Used in Linux Kernel Analysis, Callstack Analysis and others
- History Tree File:
  - Current implementation in Trace Compass
  - Scales reasonably well
- Partial State System:
  - Stores only part of the intervals
  - Query the trace to dynamically rebuild intervals to answer requests



# History Tile Backend

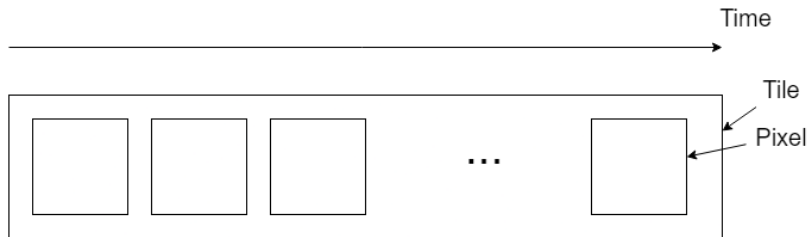


Figure: One *history tile*



# History Tile Backend

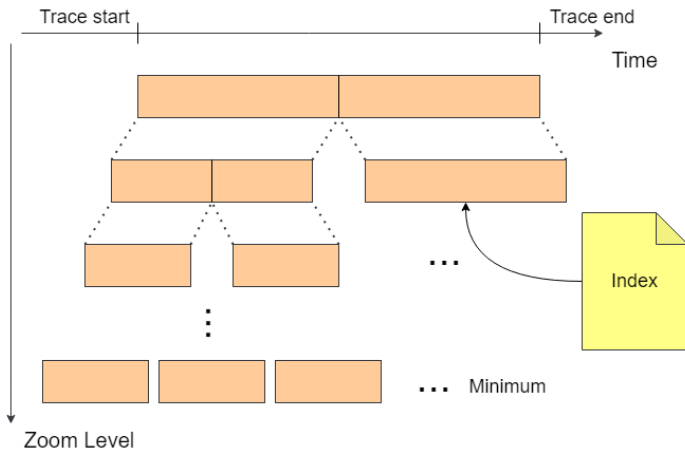


Figure: *History Tile Layers*



# History Tile Backend - Answering a query2D

- ① Query the starting tile
  - Calculate tile resolution layer
  - If not cached, read the tile on disk
- ② Query adjacent tiles
  - Check if the current tile end exceeds the requested end
- ③ Find out if any intervals were missed:
  - Check the last tile that was queried if all attributes have intervals until the end
  - Return those attributes
- ④ Run a full query to fetch any missing interval



# History Tile Backend - Answering a full query

- ① Query the biggest zoom layer tile at time  $t$
- ② Continue until all states are found
  - Query the adjacent tile
  - Calculate an *adequate*<sup>1</sup> lower zoom layer
  - Query the tile at that zoom layer

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<sup>1</sup>The adequate zoom layer can be calculated according to the minimum size of the missing intervals. Because we checked two complete tiles, the intervals must be at least one tile long. Therefore, it will be contained in any tile where the interval is longer than one pixel.

# Experiment

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- We will compare three different versions:
  - Current implementation (full)
  - History Tree Tile (tile)
  - Partial State using the History Tree Tile (partial)
- We will run a state system analysis on 8 traces of different sizes (8MB - 7GB) using each back-end
- The result of the analysis will be queried for 4 different zoom levels (showing 95%, 50%, 2.5% and 0.5%)
- The queries were made between two separated nodes in a SSH tunnel.





# Results

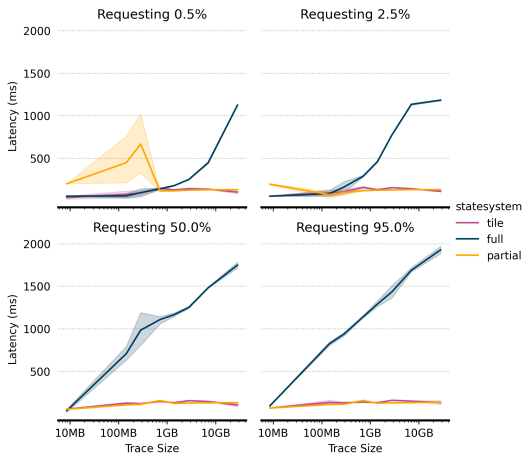
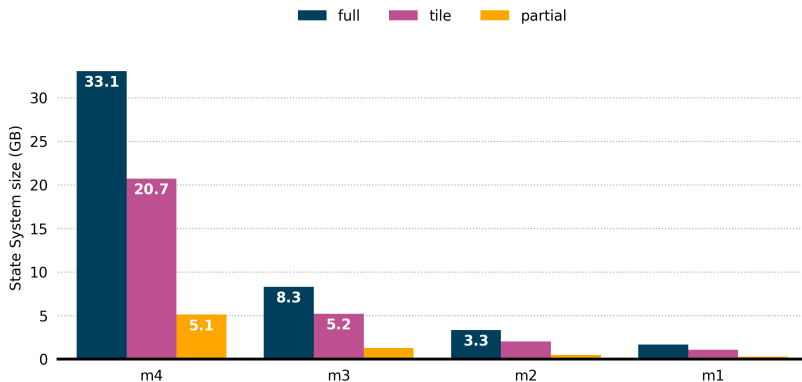


Figure: Request latencies per back-end type



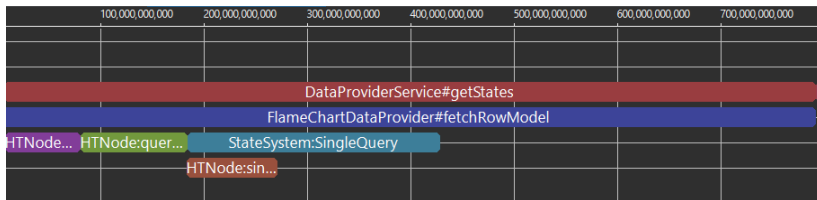
# Results



**Figure:** State system file sizes per trace analyzed



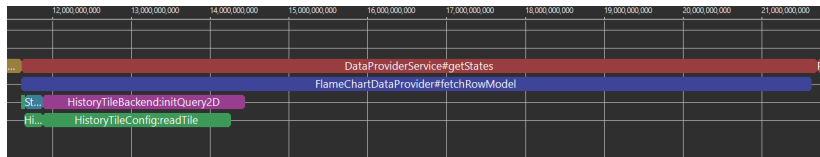
# Results



**Figure:** Flamegraph showing experiment requests (full)



# Results



**Figure:** Flamegraph showing experiment requests (tile)



# Results

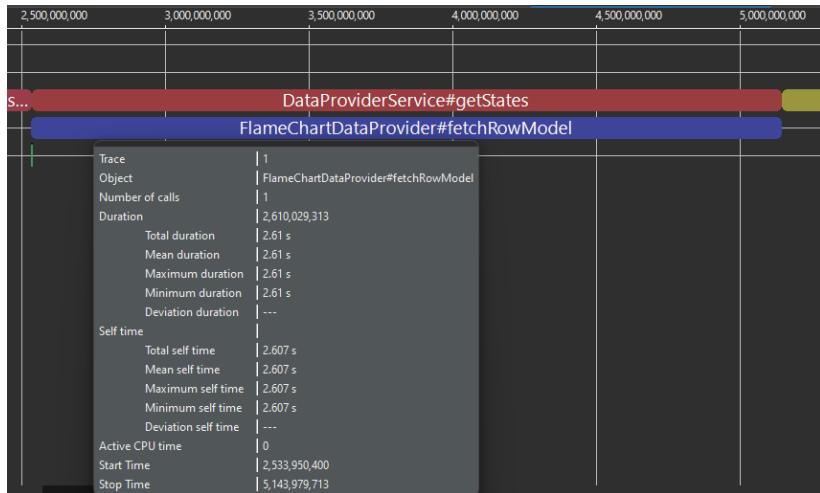


Figure: Flamegraph showing experiment requests (partial)

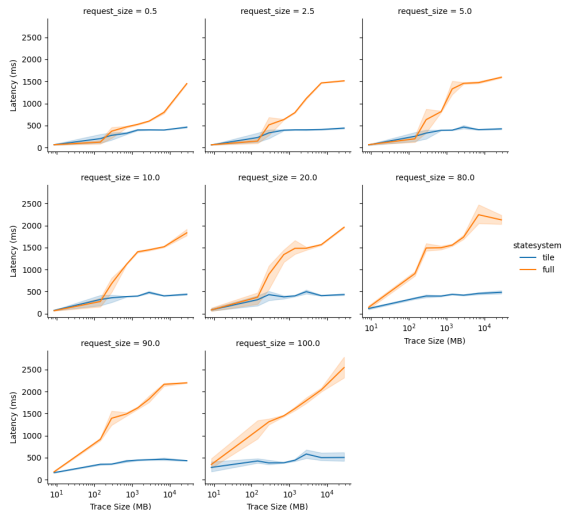
## Conclusion & Future work

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- Indicates that the history tiles scales much better
- Partial state system allows for much better intermediate files
- Caching and having a map for the interval states would allow for much smaller state system files
- These results require further analysis



# Appendix



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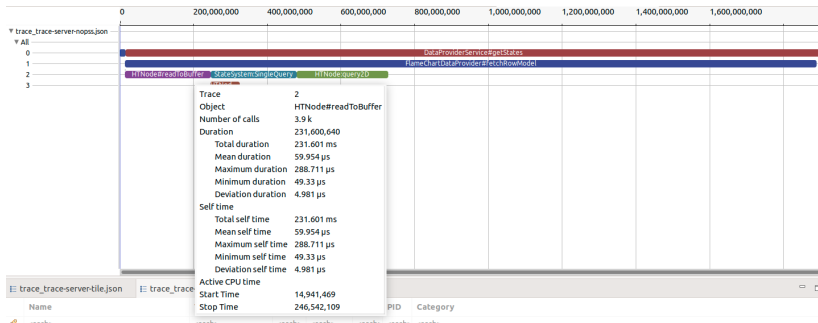
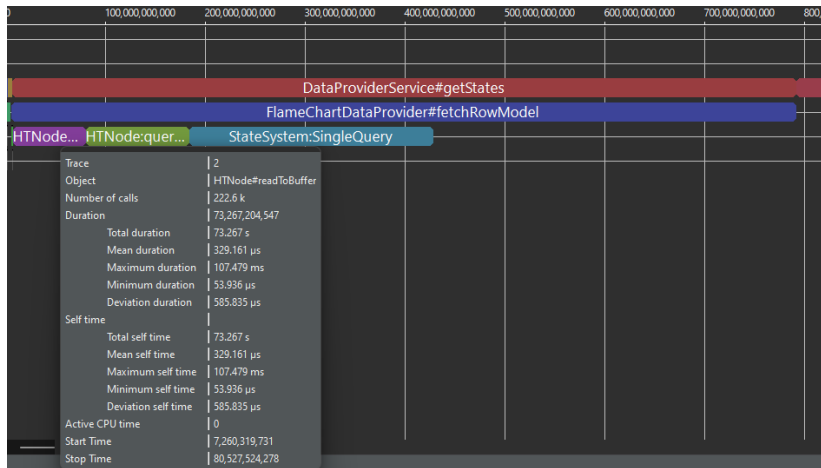


Figure: Flamegraph showing experiment requests before (full)



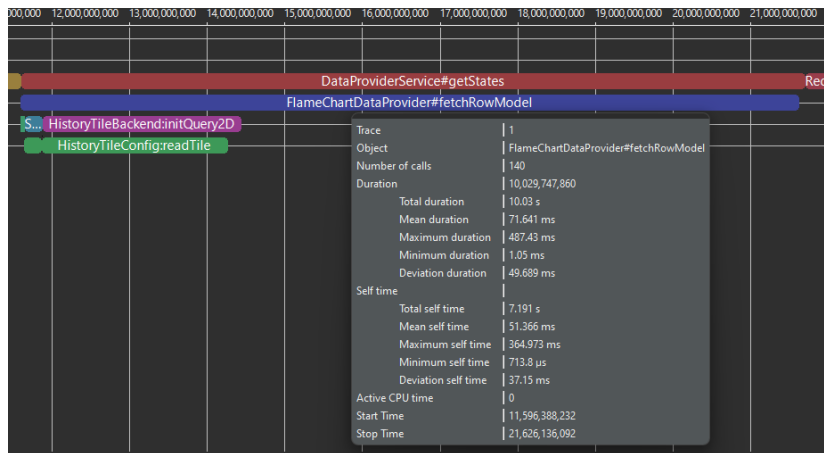


# Appendix



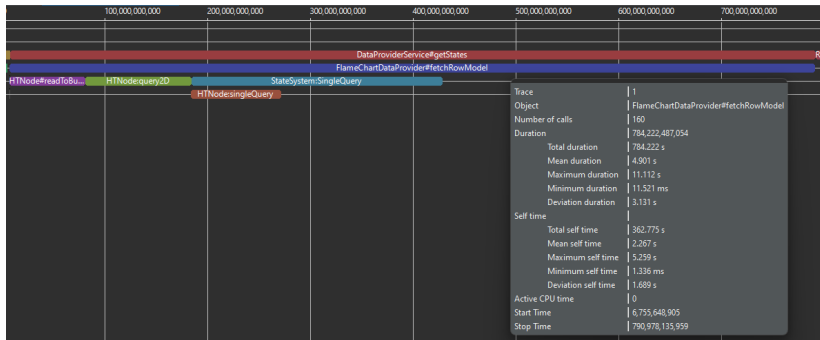
**Figure:** Flamegraph showing experiment requests after (full)

# Appendix



**Figure:** Flamegraph showing experiment requests with statistics (tile)

# Appendix



**Figure:** Flamegraph showing experiment requests with statistics (full)

