

EE/CprE/SE 492 STATUS REPORT 4

Start Date – End Date: 10/4/2024 - 10/31/2024

Group number: 9

Project title: Multicore Operational Analysis Tooling

Client &/Advisor: Steve Vanderleest/Joe Zambreno

Team Members/Role: Alexander Bashara – Embedded Engineer, Joseph Dicklin – Hardware Design Engineer, Hankel Haldin – OS/Tooling Engineer, Anthony Manschula – Project Coordinator/Engineer

Summary of October's progress:

This report covers the team's activities during the month of October.

Past report accomplishments:

The team has successfully implemented a prototype of our final design and ran three experiments to gather experimental data. We presented the data we gathered from our experiments in our client meeting to get feedback on the first iteration of our design. Our client (Boeing) was pleased with our progress but offered some feedback to guide our future efforts. The team is currently focused on building out the initial framework so we can gather experimental data with greater ease. This includes establishing a serial console connection to the host device in the lab so a user can run custom scripts and automatically launch stressors in DomUs on system startup.

Milestones reached:

- Created basic Linux DomU
- Ran stress tests in Linux DomUs
- Implemented basic Memory, Cache, and I/O test cases on our hardware platform
- Gathered test data without mitigations

Pending issues:

- Establish Communication with DomU from Dom0
- Further develop Host and Target Control/Communication Programs
 - Establish a connection between the programs
 - Simplify the current communication program
- Pass Config data between Host and Target
- Automate creation/deletion of DomU's with XL toolchain commands and shell scripts

Individual contributions:

<u>NAME</u>	<u>Individual Contributions</u>	<u>Hours this week</u>	<u>HOURS cumulative</u>
Alexander Bashara	Completed basic frontend program and helped research DomU architecture	8	87
Joseph Dicklin	Researched hping3 for packet generation	6	84
Hankel Haldin	Experimental data collection & DomU start up trouble shooting	6	83
Anthony Manschula	Continued work on DomU's for group to use in stress environment & worked on stressing binary for Arm64	8	86

Plans for the upcoming reporting period:

- Configure DomUs on Xen
- Get StressNG running on ZCU boards
- Further implement the Python control program
- Create plans for stress testing
- Add output logging and custom test commands to MOATerm

Project Work:

The following charts (figures 1, 2, and 3) show the results of our initial stressor programs running on our desired hardware platform. They plot the performance of a base line program running with and without interference generators. The memory and cache interference programs show the impact of stressors on baseline programs, while our I/O test cases still need to be constructed in such a way that interference is observable. This data provides not only proof of concept for our overall project goal, but also a foundation for the further refinement of our design.

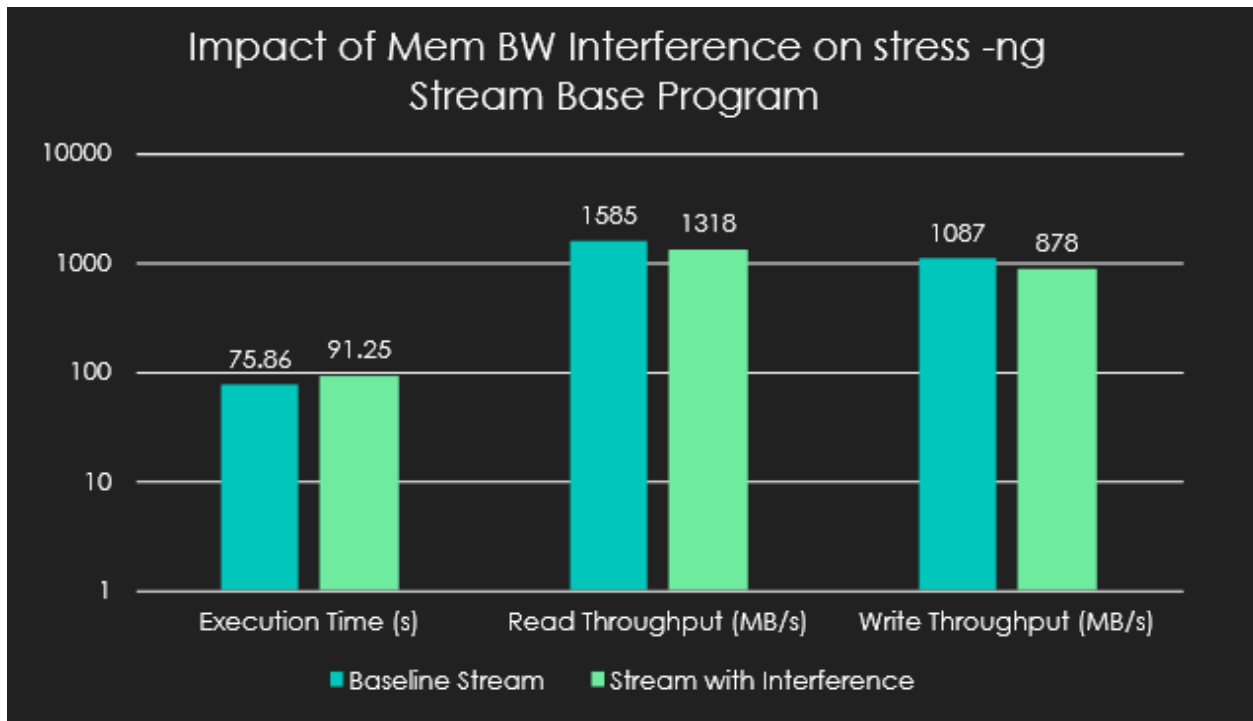


Figure 1: Performance results of the memory stressor

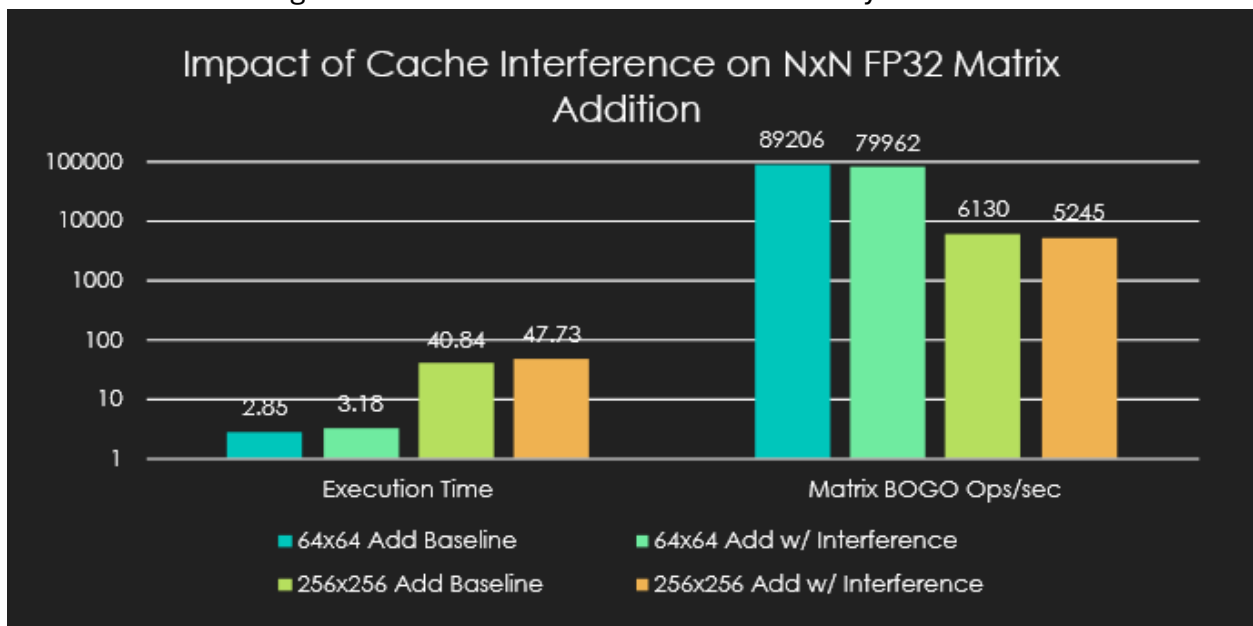


Figure 2: Performance results of the cache stressor

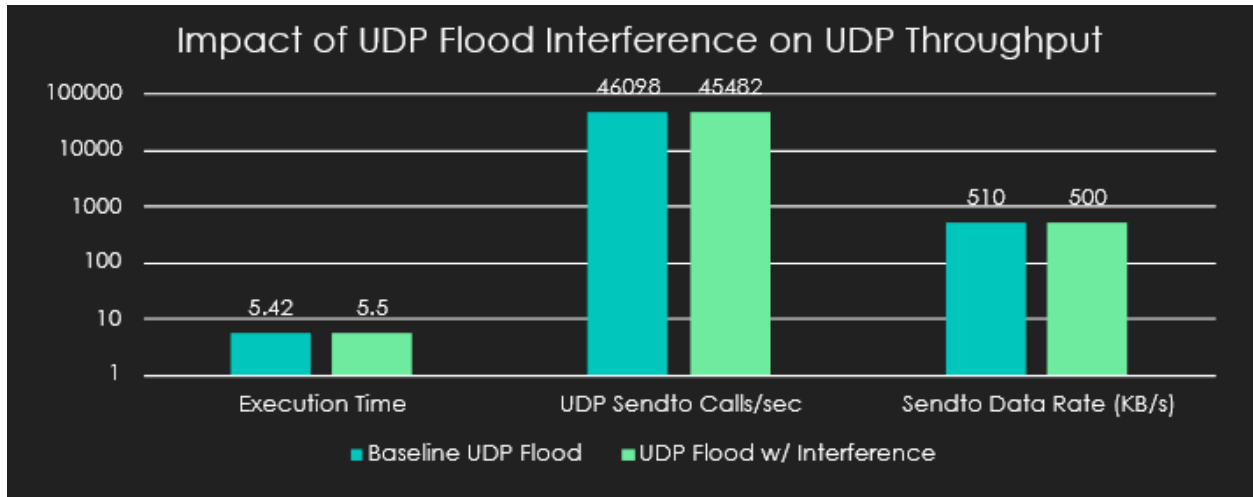


Figure 3: Performance results of the I/O stressor

Summary of weekly advisor meeting:

Our industry client is pleased with the progress we have made and has encouraged us to further develop our initial prototype. Our industry client (Boeing) expressed an interest in a statistical analysis of our experimental data to determine the Worst-Case Execution Time (WCET) of a victim program in the presence of stressors. Dr. Jones did have a chance to review our design document and initial prototype. He thought we were on the right track and urged us to get to a working prototype as soon as possible to collect data.