TLB-Shootdown Monitoring

Advanced Operating Systems Final Project

Mohammad M. Gharaguzlo, Soheil Fadaee

Spring 1402

Roadmap

Project#1: The **impact** of running **HPC applications** & **Benchmarking tools** on the **rate** of **system calls** and **TLB-Shootdowns**

Applications & Frameworks

- Tensorflow
- Matlab
- Pytorch

Selected Intensive Application Frameworks

- Deep500
- GeekBench 5

Selected Benchmarking tools

Roadmap

- Training **ResNet-50** with **Pytorch**, **Matlab** and **Tensorflow**
- Performing **GeekBench 5** benchmarking on VMs and Bare-Metal
- Performing **Deep500** benchmarking tool on ResNet-50

Roadmap

What is GeekBench 5 ?

- Developed by Primate Labs
- Benchmarking tool to measure the performance of CPUs and GPUs by using a number of different tests

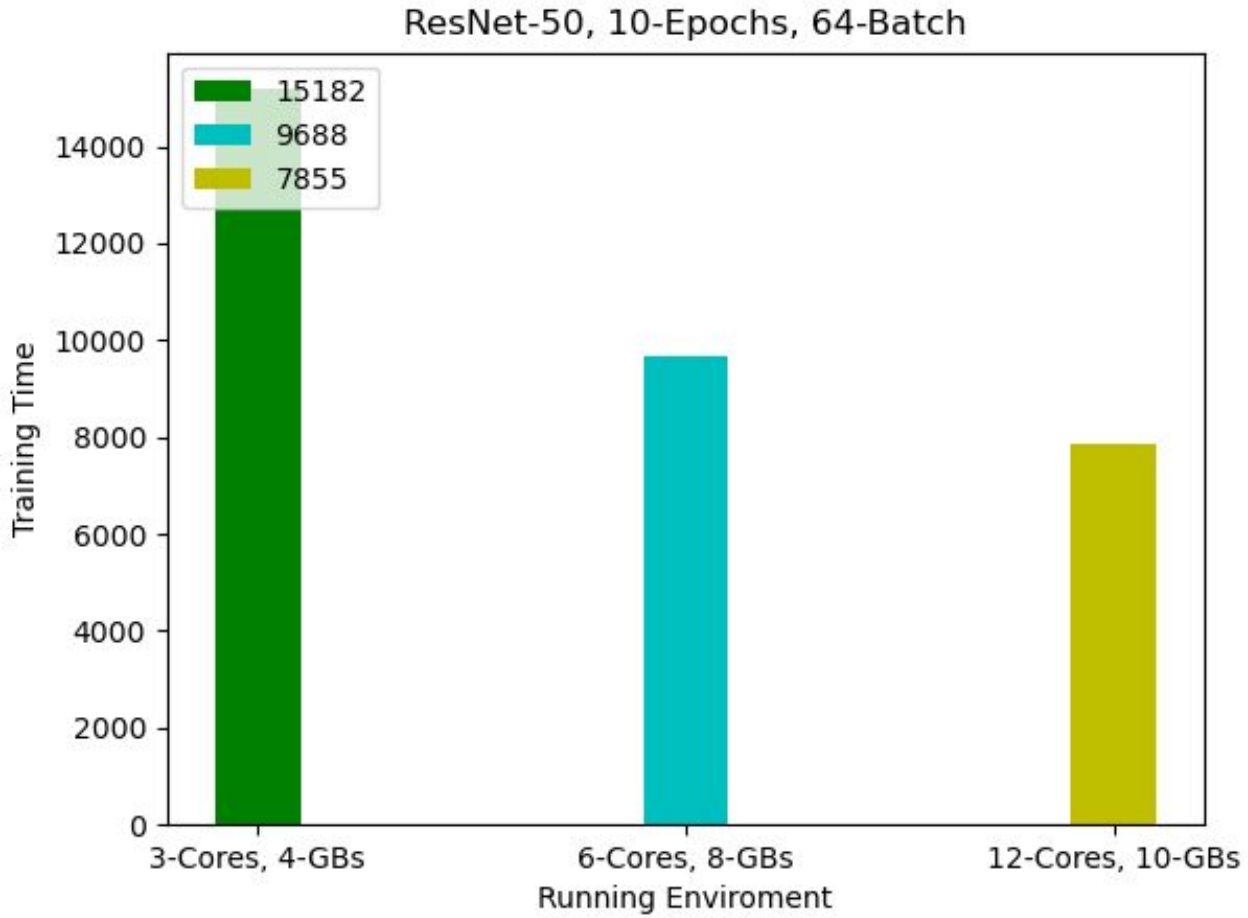
What is Deep500 ?

- Developed by a team of scientists ETH Zurich
- Evaluating the performance and accuracy of deep learning models on different hardware platforms

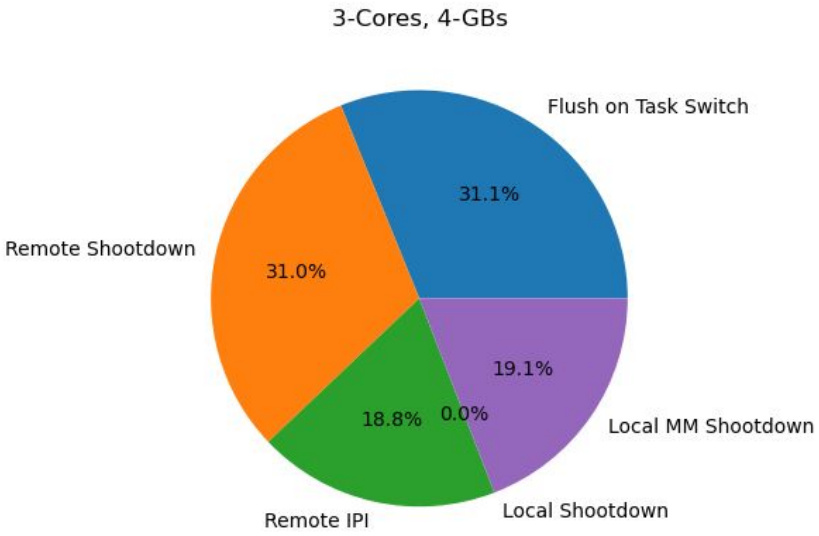
Phase #1 : ResNet (Tensorflow) on VM (Kernel v.5.4)

Phase #1 : ResNet (Tensorflow) on VM (Kernel v.5.4)

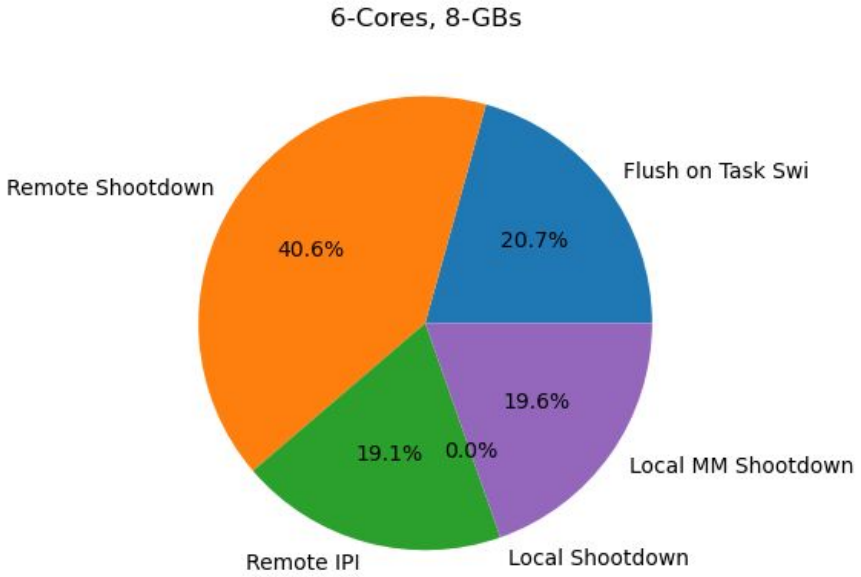
Training Time



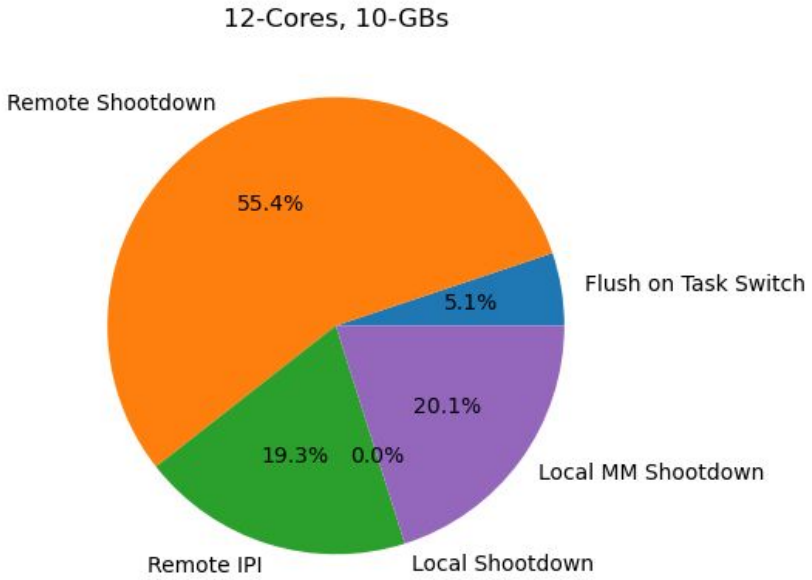
Distribution of TLB-SD Causes



ResNet-50



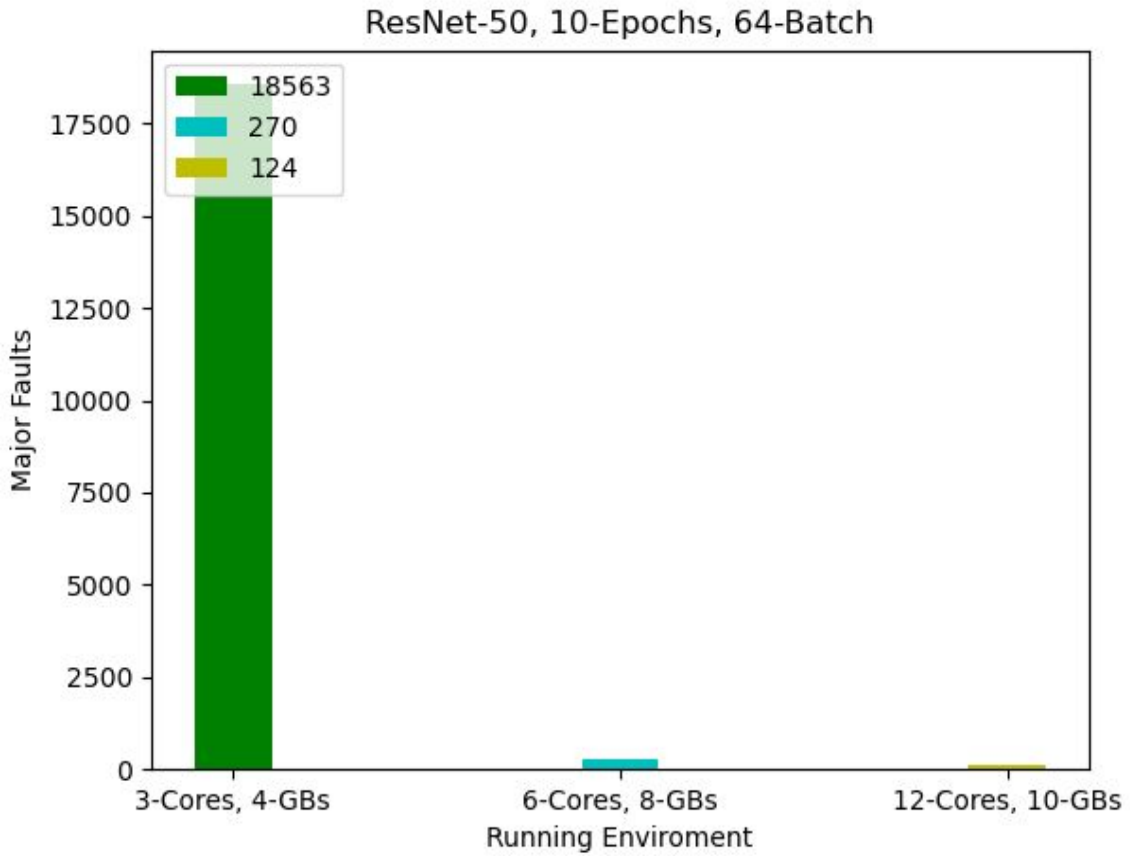
ResNet-50



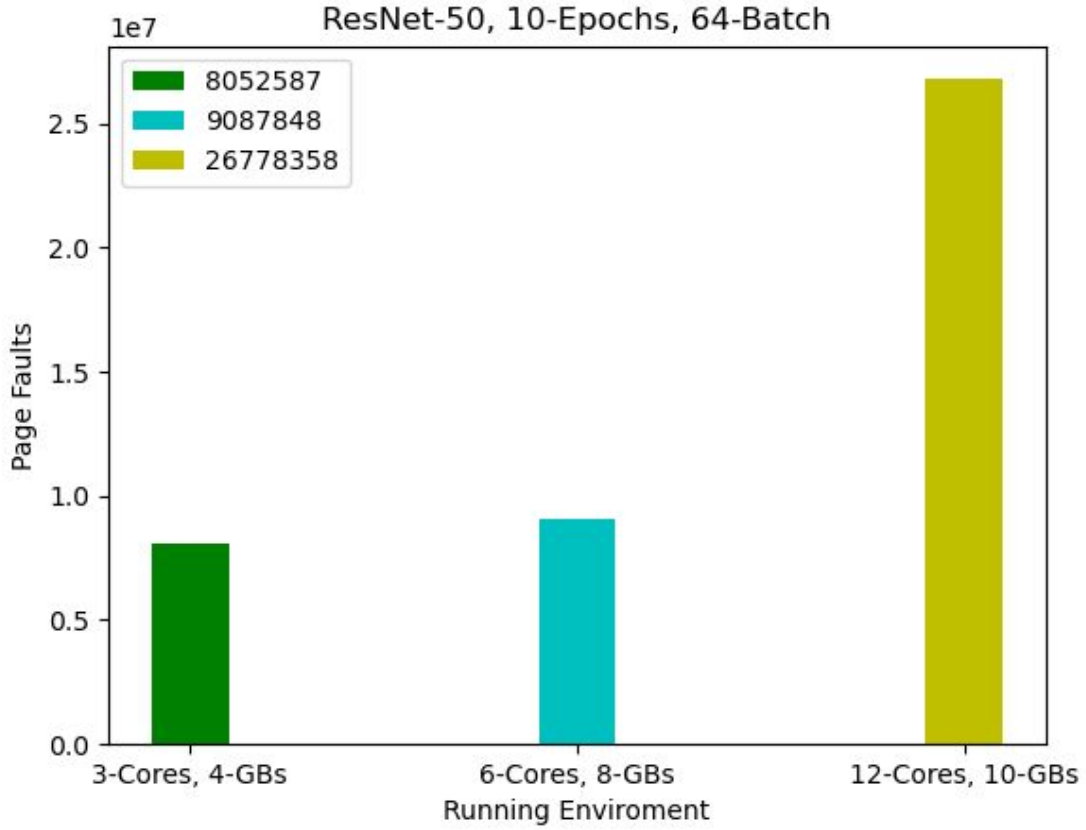
ResNet-50

Phase #1 : ResNet (Tensorflow) on VM (Kernel v.5.4)

Major Page Faults

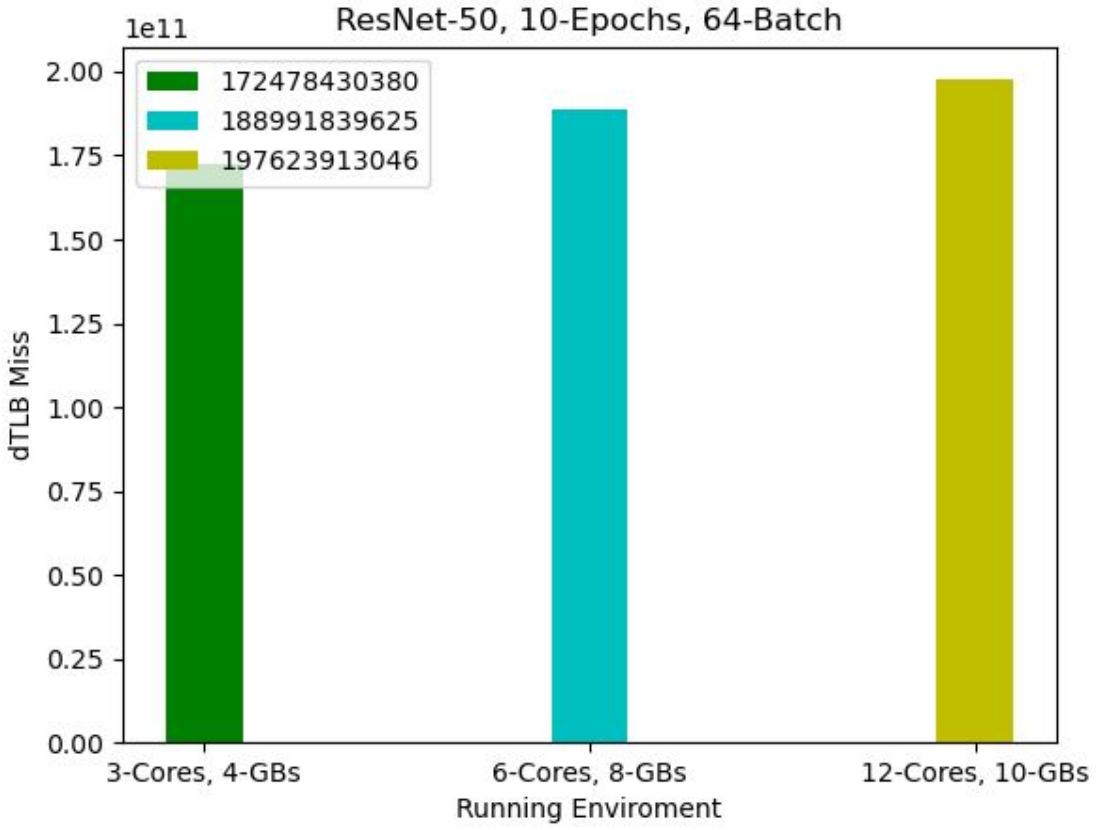


Page Faults

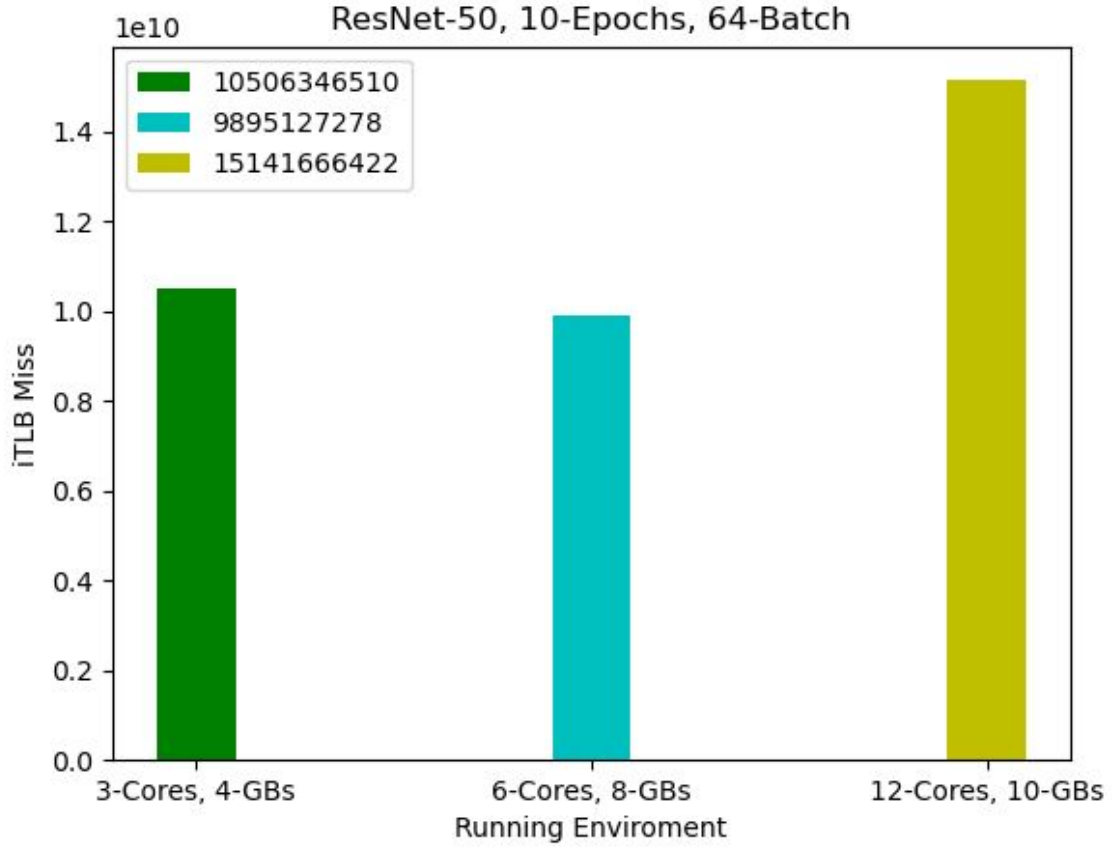


Phase #1 : ResNet (Tensorflow) on VM (Kernel v.5.4)

dTLB Misses

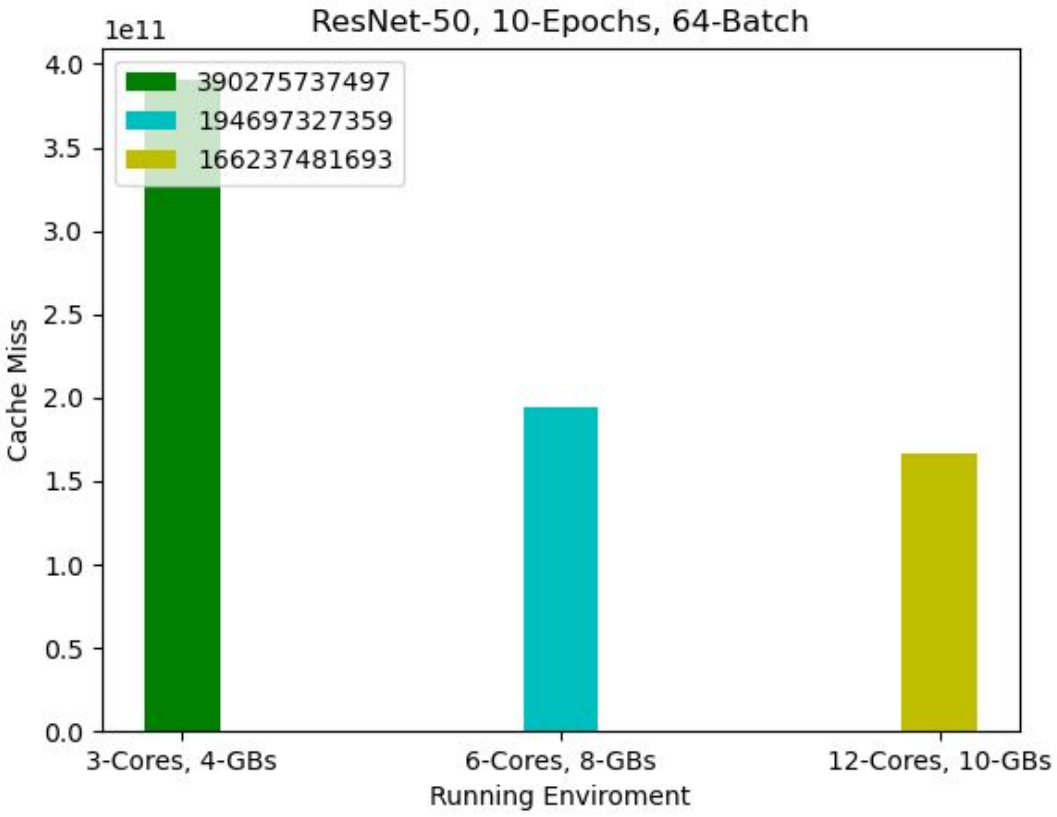


iTLB Misses

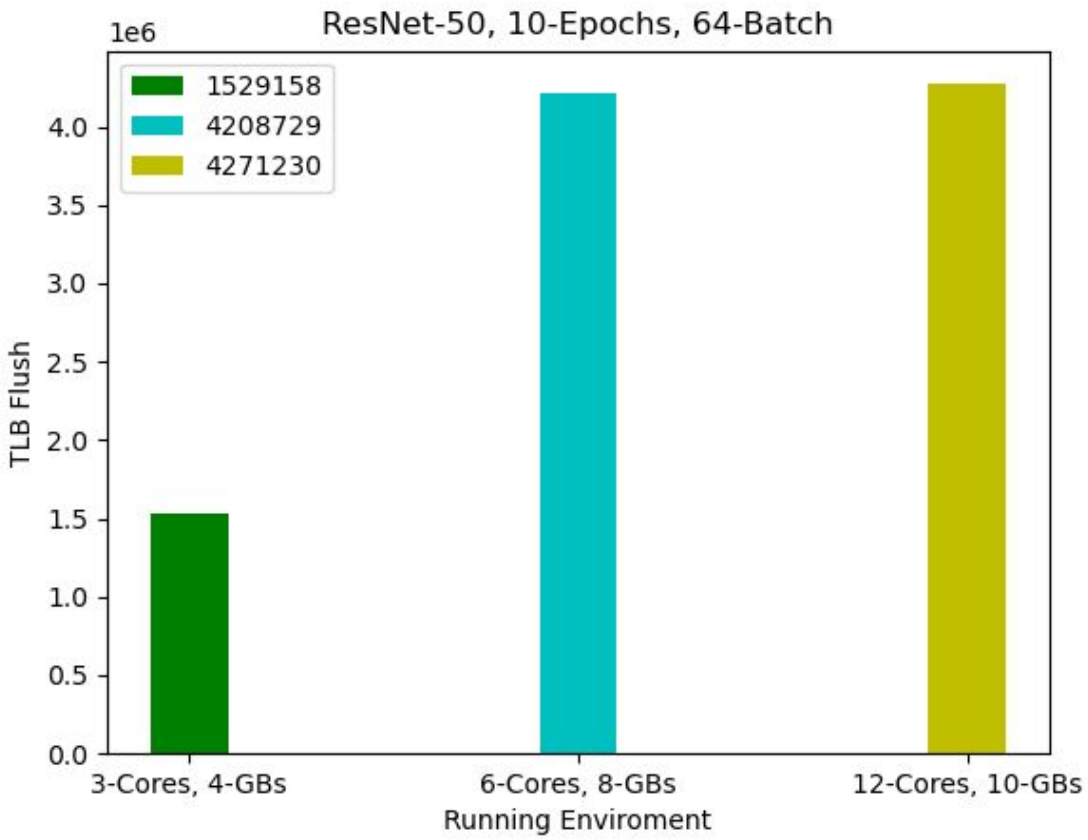


Phase #1 : ResNet (Tensorflow) on VM (Kernel v.5.4)

Cache Misses



TLB Flush



Phase #1 : GeekBench5 on VM (Kernel v.5.4)

Phase #1 : Example of GeekBench5 on VM (Kernel v.5.4)

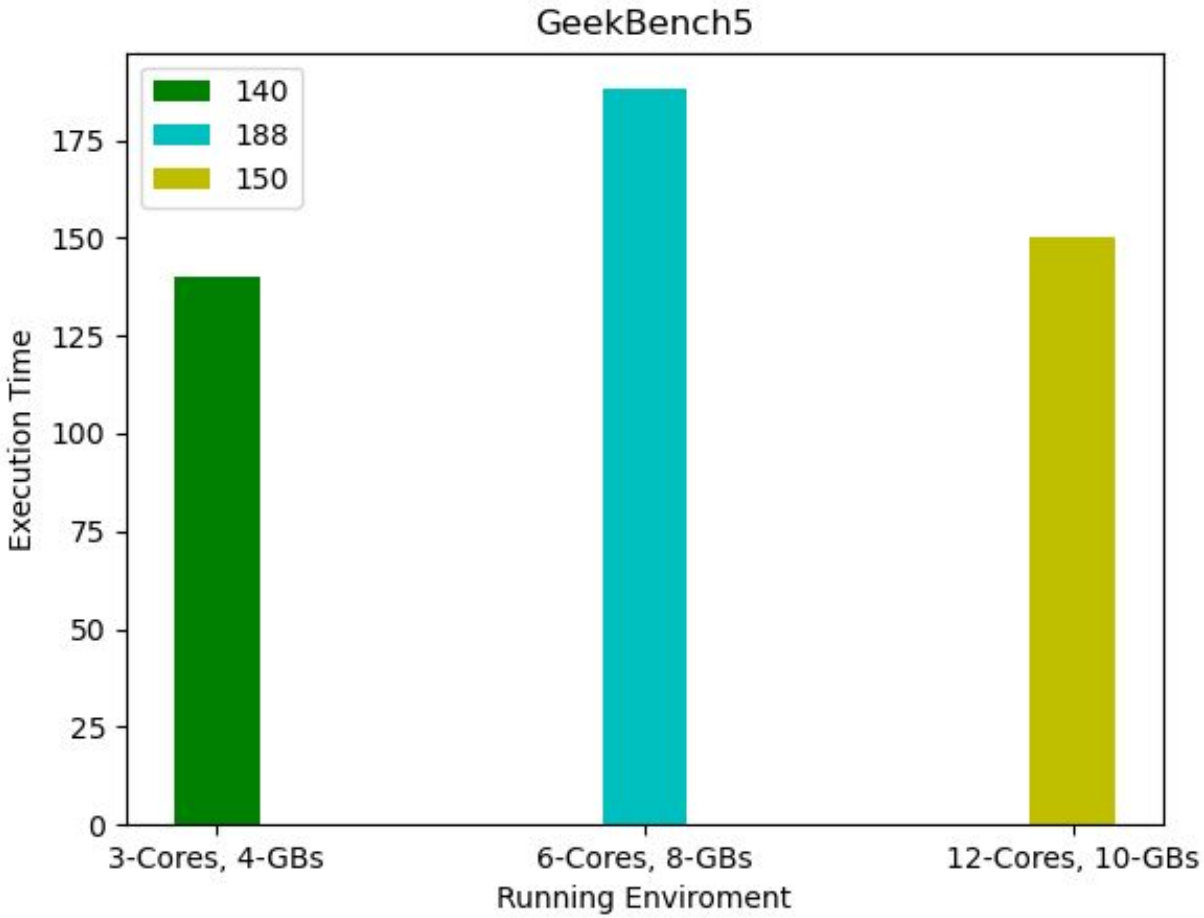
An example of running GeekBench5 on 3-core, 4GB VM

Single-Core Performance		**Multi-Core Performance**	
SQLite	755 236.6 Krows/sec	SQLite	2178 682.2 Krows/sec
Clang	787 6.13 Klines/sec	Clang	2342 18.3 Klines/sec
Face Detection	795 6.12 images/sec	Face Detection	2332 18.0 images/sec
Speech Recognition	846 27.0 Words/sec	Speech Recognition	2417 77.3 Words/sec
Machine Learning	587 22.7 images/sec	Machine Learning	1753 67.8 images/sec

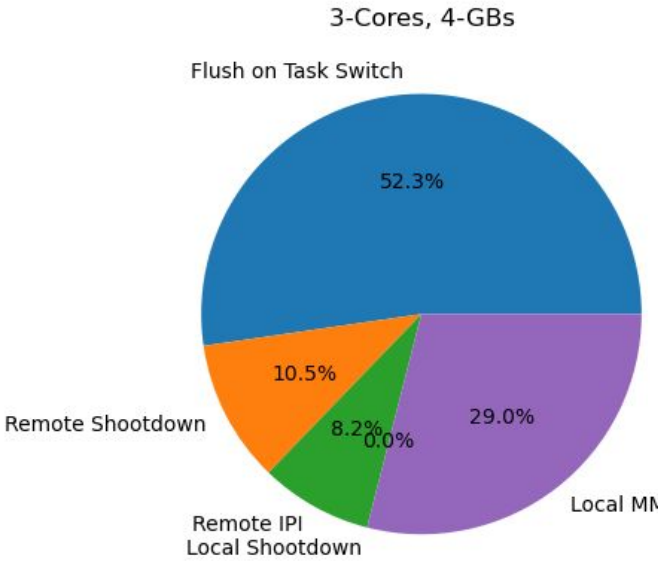
3 Cores - 4GB

Phase #1 : GeekBench5 on VM (Kernel v.5.4)

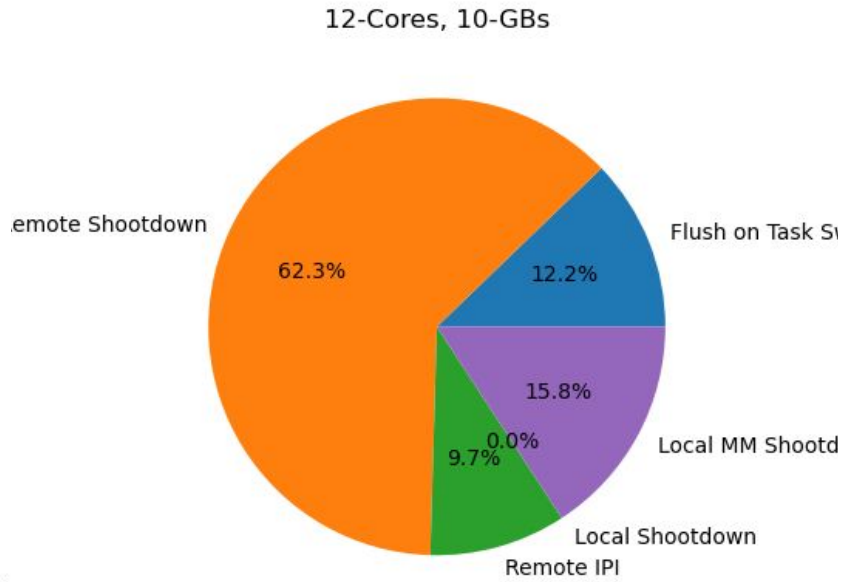
Execution Time



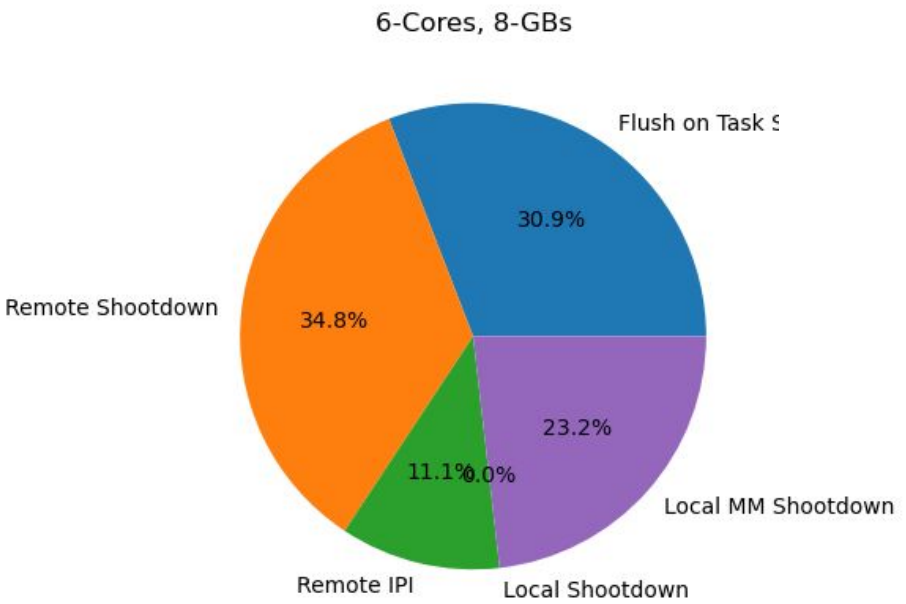
Distribution of TLB-SD Causes



GeekBench5



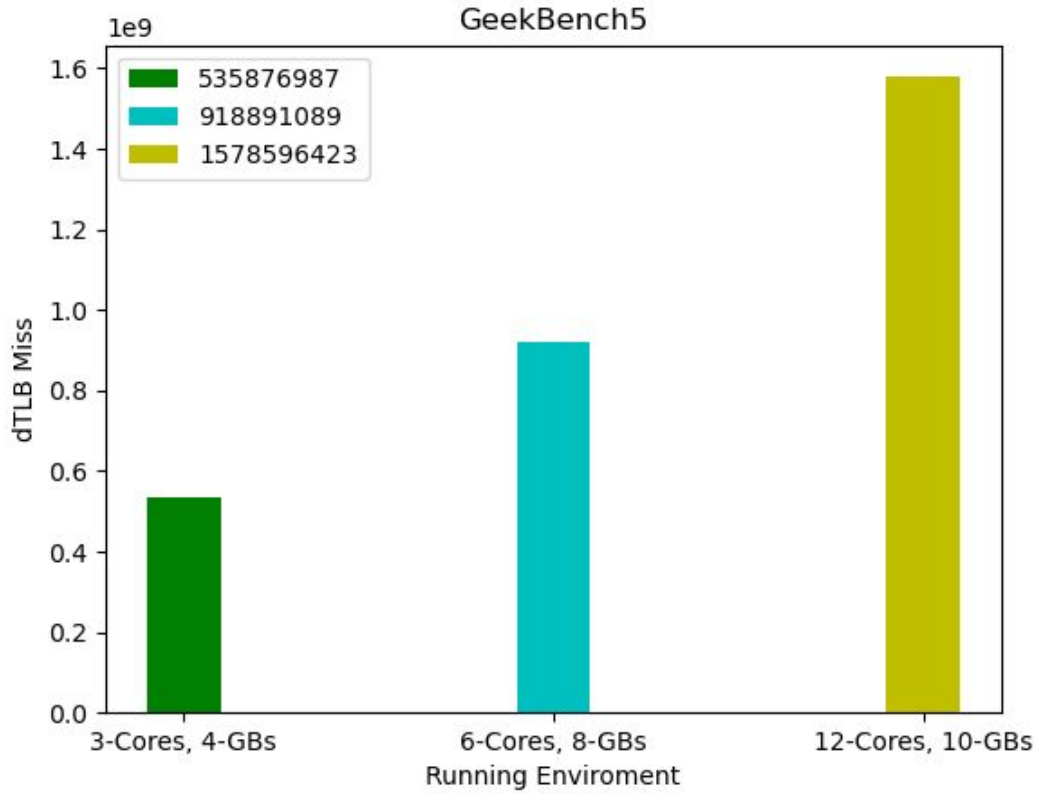
GeekBench5



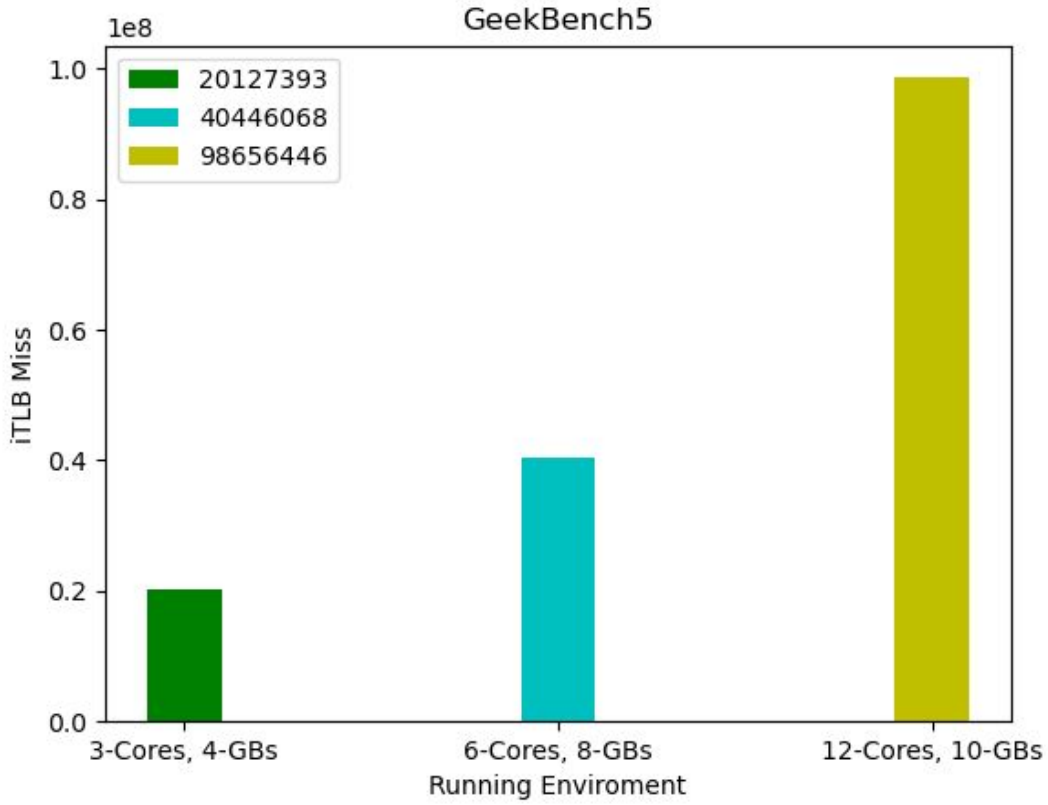
GeekBench5

Phase #1 : GeekBench5 on VM (Kernel v.5.4)

dTLB Misses

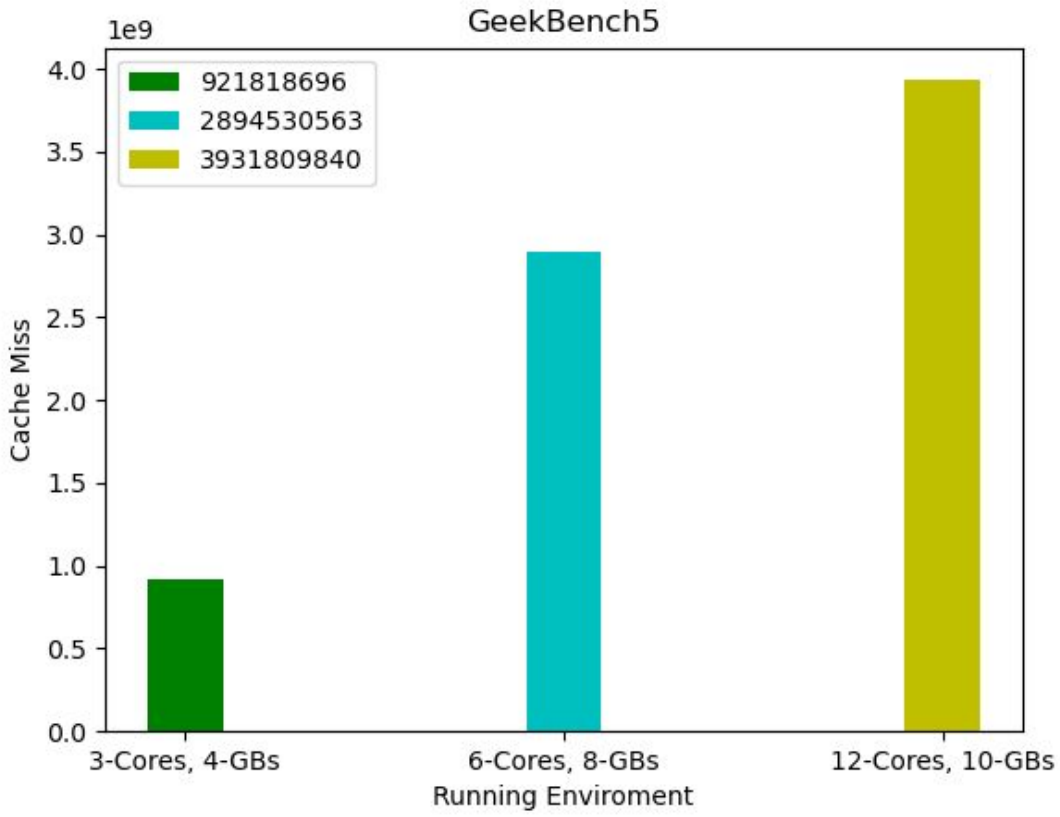


iTLB Misses

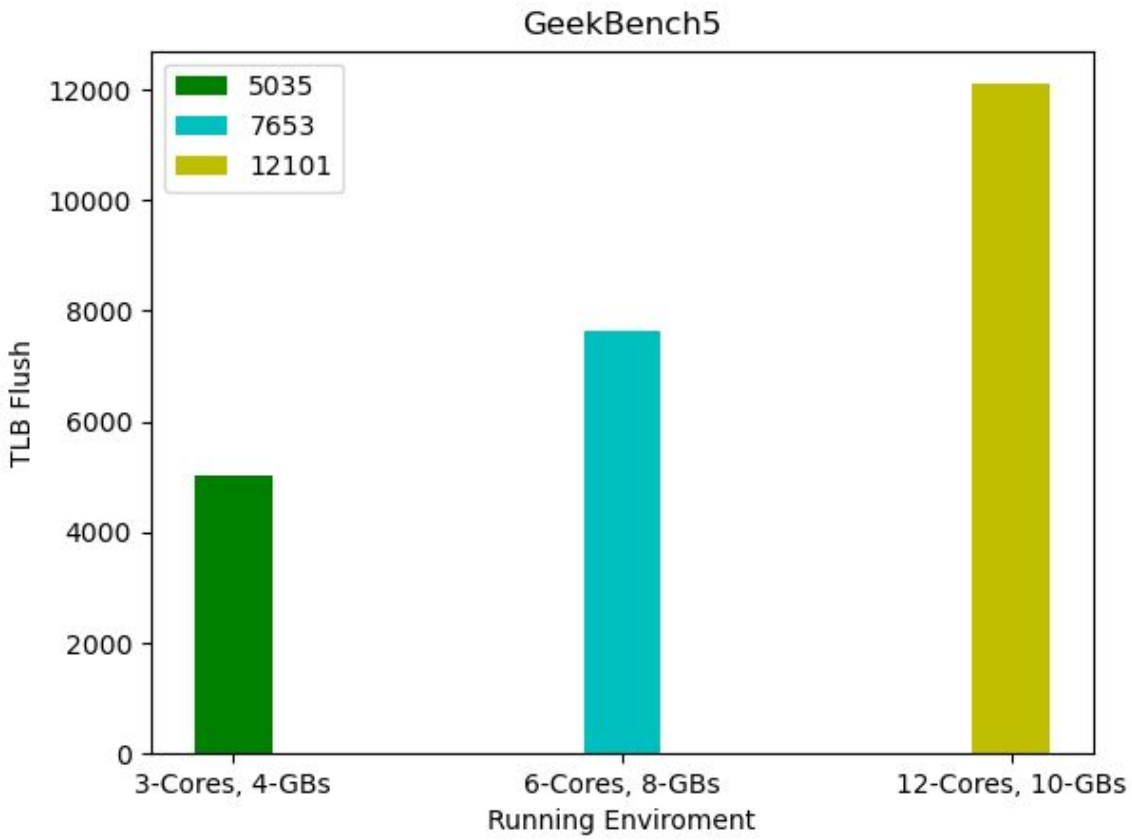


Phase #1 : GeekBench5 on VM (Kernel v.5.4)

Cache Misses

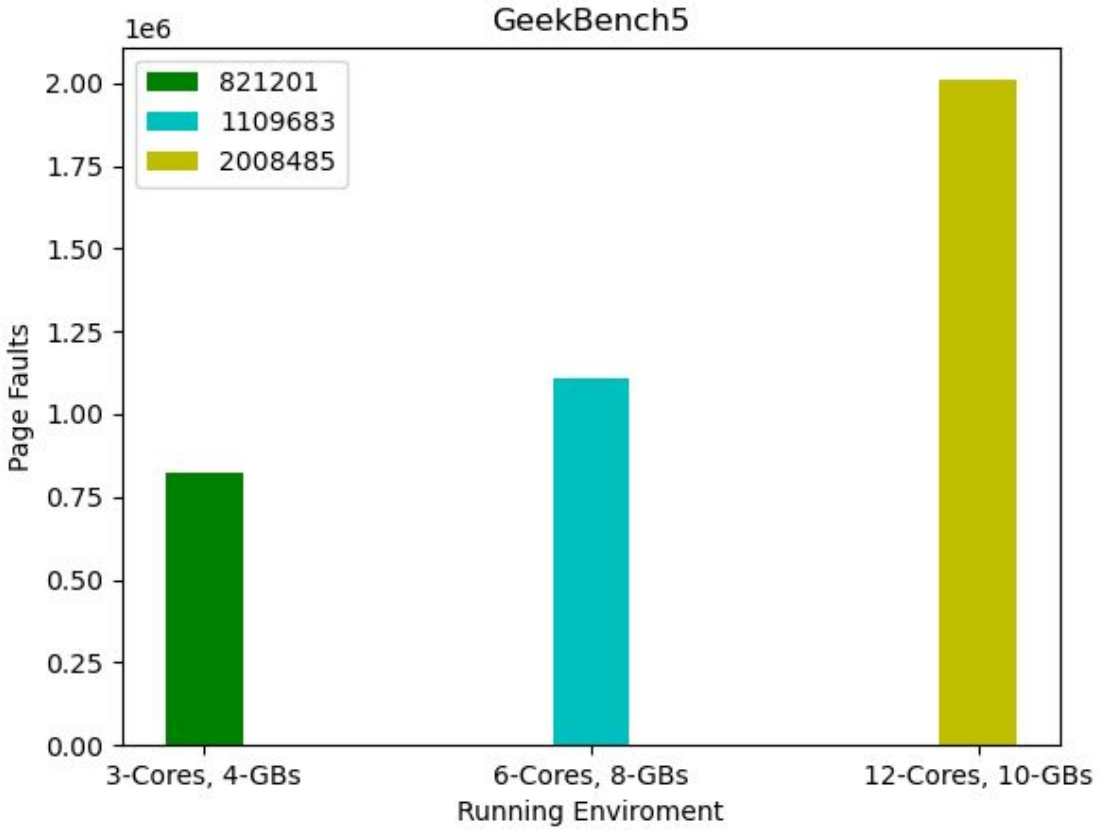


TLB Flush



Phase #1 : GeekBench5 on VM (Kernel v.5.4)

Page Faults



Thank You

Any Questions?