

**Project Title:** saveCHIMP (save CHIp Multi Processor)

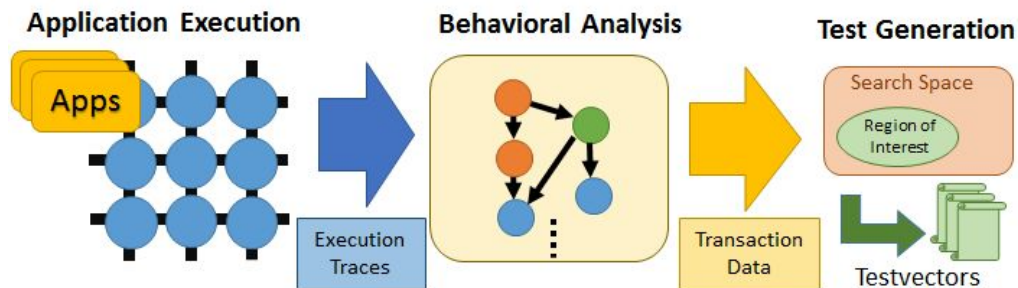
**Team Name:** DAT

**Team Members:** Arjun Khurana, Dong-hyeon Park, Timothy Wong

Idea/solution to be investigated by the project

We want a framework to do the following:

1. Given a program/software expected to run on the system, identify the characteristic transactions and behaviors that are exercised by the program.
2. Represent the transactions/behaviors in a model that can help us identify a search space.
3. Generate several series of targeted tests for the particular search space we are interested in. We will focus our effort in this project on applying our idea on a homogeneous system (e.g. a network of CPUs).



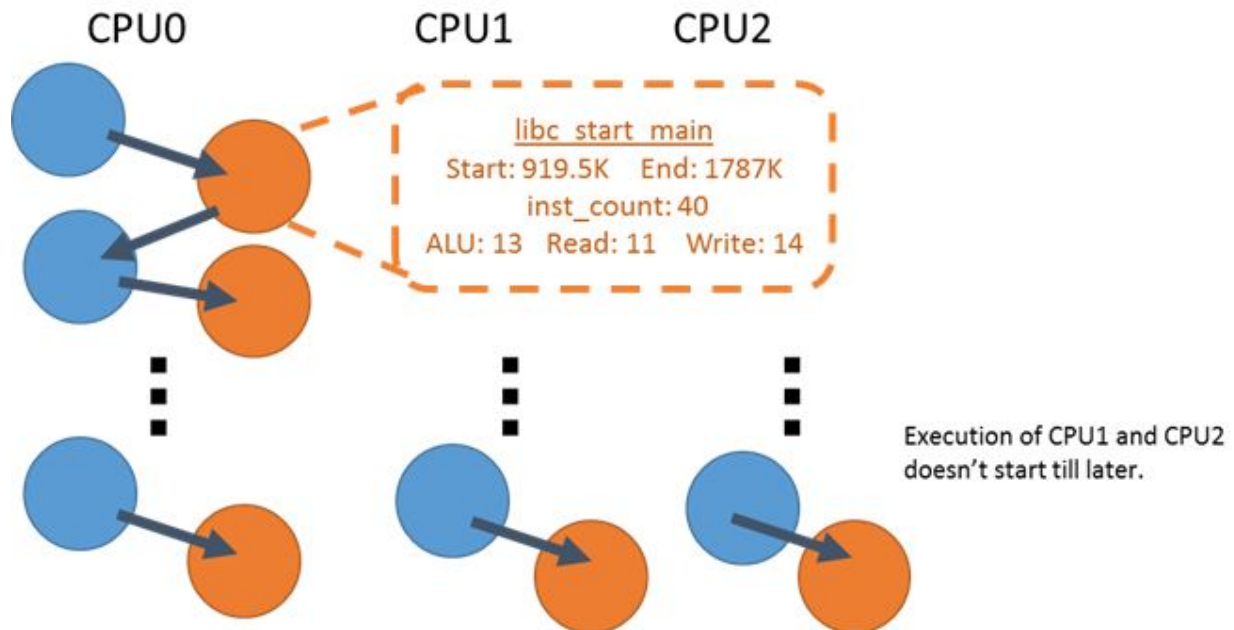
Progress so Far

So far we accomplished:

- Configured a ARM system with directory-based MOESI cache coherency on a 4x4 Mesh network on Gem5 simulator.
- Generated instruction and network traces of the system running Parsec Benchmark in system emulation mode.
- Extracted instruction flow of each CPU to model the execution behavior. We identified the functional execution blocks based on the instruction stream. We created data vectors based on: start and end cycle, label of the execution segment, number of instructions executed, number of read, write and alu operations, and the cpu ID.
- Sample data:

CPU	START_CYCLE	END_CYCLE	LABEL	NUM	ALU_COUNT	MEM_READ_COUNT	MEM_WRITE_COUNT
system.cpu00	96000	831500	@_start	18	8	4	3
system.cpu00	919500	1787000	@_libc_start_main	40	13	11	14
system.cpu00	1888000	8409000	@_dl_aux_init	273	122	90	43
system.cpu00	6471000	6704000	@_libc_start_main	8	5	4	0
system.cpu00	6795500	6807500	@_dl_discover_osversion	7	4	0	3
system.cpu00	6909000	7014500	@_uname	9	6	1	1
system.cpu00	7110500	7487500	@_dl_discover_osversion	61	53	8	0
system.cpu00	7489500	7800500	@_libc_start_main	15	9	6	1
system.cpu00	8144500	9260000	@_pthread_initialize_minimal	74	42	16	15
system.cpu00	9346000	9479500	@_mmap	26	13	5	3
system.cpu00	9481500	9563500	@_pthread_initialize_minimal	9	7	3	0
system.cpu00	9655000	10127500	@_memcpy	70	30	11	14
system.cpu00	10129500	10141500	@_pthread_initialize_minimal	8	7	1	0
system.cpu00	10143500	10283500	@_libc_start_main	15	8	7	1
system.cpu00	10285500	10758000	@_memcpy	52	30	7	7
system.cpu00	10760000	10887500	@_libc_start_main	8	3	5	1

- Sample Behavior Extraction:



### Issues/Showstoppers

Main challenges we are currently facing:

- It is difficult to extract network packet traces from the debug outputs we get from gem5. We are working on tweaking the gem5 source code to extract the information directly.
- The size of the debug and trace files are extremely large and slowing down our analysis. We are working with a highly condensed dataset, but even then the file size is extremely large.
- Some of the parsec benchmarks are having trouble running on gem5 due to problems in cross-compiling with ARM ISA.