**DESIGN DOCUMENT**

**(Programming Assignment 1-Benchmarking)**

**Team**

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This design document consists of 5 segments namely,

1. CPU Benchmark
2. GPU Benchmark
3. Memory Benchmark
4. Disk Benchmark
5. Network Benchmark

**Design Description of each Benchmark:**

1. **CPU:**

The design for the CPU benchmarking contains two functions gflops and giops which calculate the GFLOPS and GILOPS for the cpu using the time taken for the computation of the respective operations. The number of threads can be set dynamically as user input and each thread calculates the time taken independently and the optimal values are obtained from these. The flops and iops is then calculated from the no of threads, no of operation,no of iterations and time taken. For each no of threads, both the GFLOPS and GIOPS are calculated.

1. **GPU:**

The design of the gpu benchmarking has two separate code gpu.cu for gflops calculations and gpuiops.cu for giops calculation. Both calculations are done dynamically using device properties to calculate the grid size and the block size. Then the highest concurrency is achieved using the threading where it maps 1 thread per core. The flops and iops is then calculated from the no of threads, no of operation, no of iterations and time taken. Also the memory bandwidth and the latency is calculated in the mem.cu program for varying no of block sizes which are defined as a macro and have to be changed manually to change the size.

1. **Memory:**

In memory benchmarking, there are two functions func() and randfunc which do both the read and write operations for their respective sequential and random memory access. The block size and the number of threads are defined as macros and have to be manually changed .Each thread calculates the time taken independently and the optimal values are obtained from these. The throughput and latency are also calculated using the time taken.

1. **Disk:**

In disk benchmarking, there are library functions read() ,write () , seek() and randint().

For sequential read and write are functions are used. For random read and write randint() is used to generate a random block to read and seek() is used to move the file pointer to the block read. Each thread calculates the time taken independently and the optimal values are obtained from these. The throughput and latency are also calculated using the time taken.

1. **Network:**

We divide the network benchmarking into two programs namely client and server. We send varying packet/buffer size from client to server, which in turn sends it back to the client. We do this for 1 thread and 2 threads in both TCP and UDP which is represented in the functions simple\_client & simple\_server(1 thread ),thread\_simple\_client & thread\_simple\_server(2 threads) for TCP and UDP\_client & UDP\_server(1 thread),thread\_UDP\_client & thread\_UDP\_server for UDP in the source code.