Group 2 Project– Status Report – May 24, 2018
CS533 Spring 2018

Topic: Power and data movement

Group Members:

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- Shikha Shah <shikha2@pdx.edu>
- Ajinkya Shinde <ajsh2@pdx.edu>
- Jason Graalum <jgraalum@pdx.edu>

Meeting Time: Tuesday’s at 12:00
Meeting Location: Fishbowl

GitHub Repo: https://github.com/jasongraalum/CS533_Spring2018_Group2_Project

Goals:

1. Write benchmark codes that target specific configurations expected to be power efficient or power inefficient.
2. Conduct a study using the benchmarks to actually measure the power consumption.

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May 24, 2018 Meeting Notes

1. Compression code has been selected – simple LZW.
    a. We have C code and it is compiling and running on the Raspberry Pi 3
2. Power Meter for the Raspberry Pi 3 is working
    a. Typical current draw is 300ma with spikes to 450ma under load
    b. Unsure if there are some load limits set to avoid high power and need to look into this
3. Map-Reduce
    a. Multi-threaded code is checked into repo
    b. Moved from using Python library calls to simpler fork/joins.
    c. Test files have been created
        i. Random files do not compress with LZW – need text files
        ii. Using some available text – alice_in_wonder_land.txt and Ulyesses.txt
4. Simple data movement script
    a. Script written – simple allocation of variable sized blocks with writes to specific offsets
    b. Combined with perf command and schedtool
        i. perf – output performance counters <- Counts not making sense need to review
        ii. schedtool – used to set nice value(19) and core affinity(pin process to a core.) <- This seems to be working well
5. Reorganized git repo

    a. Because a certain team member is just that way.

May 15, 2018 Meeting Notes

1. Map-Reduce
    a. Challenge converting code to multi-core/threaded
        i. Kelly to look at Shikha's code
    b. Need to look into "mpi" – message passing interface – to pass data between cores.
    c. Look at existing multi-core map reduce
        i. Metis? https://github.com/ydmao/Metis
    d. TASK: Shikha will email MPI slides and scatter/gather details to the group
2. Raspberry Pi 3's on order
    a. ETA – 5/16 – Arrived – need to test
3. USB Power Meter
    a. Current meter broken – voltage drops
    b. New meters on order – ETA 5/15
4. Compression will use gzip and 7z. - Kelly
5. TinyCore OS looks promising for light weight OS to isolate performance
6. Need to decide on data/graphing format
    a. Variables: 1/2/4 cores, compressed vs. non-compressed data, MapReduce
7. Compress/Decompress data sets
    a. Natural Language/Audio – looking into how compressible the data is?
8. Will create a "dumb" program to transfer data between cores with no operations. The program will take a size argument for the data to transfer and fill with random data – Jason
9. Team to meet Thursday to discuss MPI/Map Reduce.

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May 8, 2018 Meeting Notes

1. Settle on Raspberry Pi 3 as hardware platform
2. Benchmark #1 - Transfer and operation on compressed vs non-compressed data
    a. Compare data movement cost of uncompressed data to cost of compression/decompression in the core prior to operation
    b. Single-core performance
    c. Benchmark variables
        i. Data size
        ii. Operation complexity
        iii. Operation cache use
        iv. Data type (diverse data sets)
        v. Data config
            1. Some large blocks

            2. Many small blocks
        vi. Different compression algorithms
    d. Measurements
        i. Performance
            1. Latency
        ii. Power
    e. Operations
        i. Word count
        ii. Sort
3. Benchmark #2 - Map Reduce
    a. Extend the compression/un-compression idea to map reduce across multiple cores on the same CPU.
    b. Details to follow

Tasks

- Obtain hardware resources – Jason/Kelly
    - Start with Raspberry Pi 3 – four-core with microSD “hard drive”
    - Possibly connect 2 Raspi’s via Ethernet to extend MapReduce benchmark to many CPUs.
    - Power meter – Jason
- Decide on operations and dataset for compress/decompress benchmark – Kelly
- Decide on compression algorithms – Jason
- Look into how to isolate experiment setup on RasbPi. - Jason
- Create map-reduce code – Shikha/Ajinkya
- Decide on function to be executed in map-reduce – Shikha/Ajinkya
    - Shikha’s word-count map-reduce code?

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May 2, 2018 Meeting Notes

Approach

1. What is measurable? We want to be able to objectively evaluate.
2. Benchmark
    - Look at data configuration/complexity as a potential source of power differentiation
    - Routines or algorithms to manipulate the data
3. Depending on what is measurable, we need to decide at what level of hardware to observe.
4. Do we look at artificial data movement or data movement as the result of data organization/computation?
5. Weekly meetings – Tuesday at noon in the fishbowl

Tasks:

Jason – what power measurements are available? What hardware is available?

Kelly – begin initial data configuration definitions/investigations
Shikha - come up with ideas on stressing CPU power use - both data movement and computation
Ajinkya - what instrumentation is available for gather statistics regarding CPU/system operation.  Are there some current research interests in power usage?