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High Performance Computing - Assignment 1.2

Screenshots

15th April 2021

1 Question 1

```
Device number: 0
i) GPU Name and Warp Size:
  Device name: Tesla T4
  Warp size: 32

ii) Computation Capabilities and memory sizes:
  Compute capability: 7.5
  Clock Rate: 1590000 kHz
  Total SMs: 40
  Shared Memory Per SM: 65536 bytes
  Registers Per SM: 65536 32-bit
  Max threads per SM: 1024
  L2 Cache Size: 4194304 bytes
  Total Global Memory: 15843721216 bytes
  Memory Clock Rate: 5001000 kHz

iii) Max Block Dimensions and Grid Dimensions:
  Max threads per block: 1024
  Max threads in X-dimension of block: 1024
  Max threads in Y-dimension of block: 1024
  Max threads in Z-dimension of block: 64

  Max blocks in X-dimension of grid: 2147483647
  Max blocks in Y-dimension of grid: 65535
  Max blocks in Z-dimension of grid: 65535

  Shared Memory Per Block: 49152 bytes
  Registers Per Block: 65536 32-bit
  Warp size: 32
```

2 Question 2

Input:

```
char h_string[500000] = "Today, there were many people who wished me well.";
char h_pattern[100] = "well";
```

This should match at position 45.

Output:

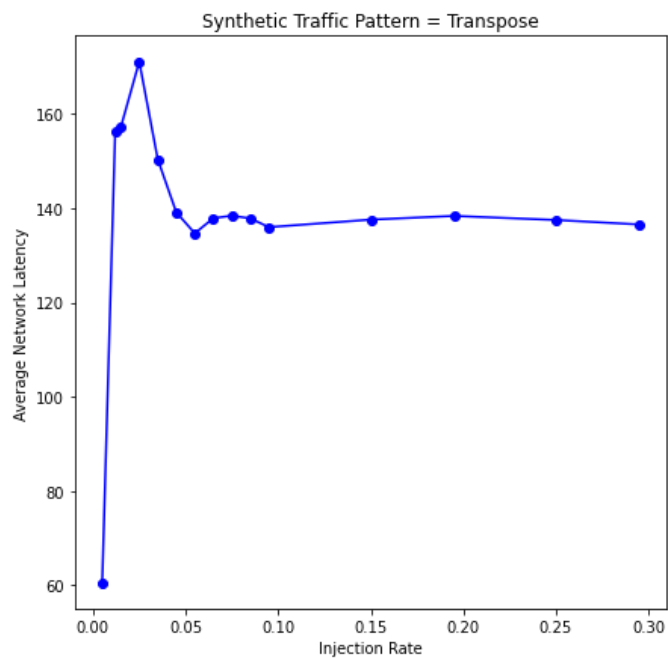
4 7 2 4

Pattern Found at position: 45

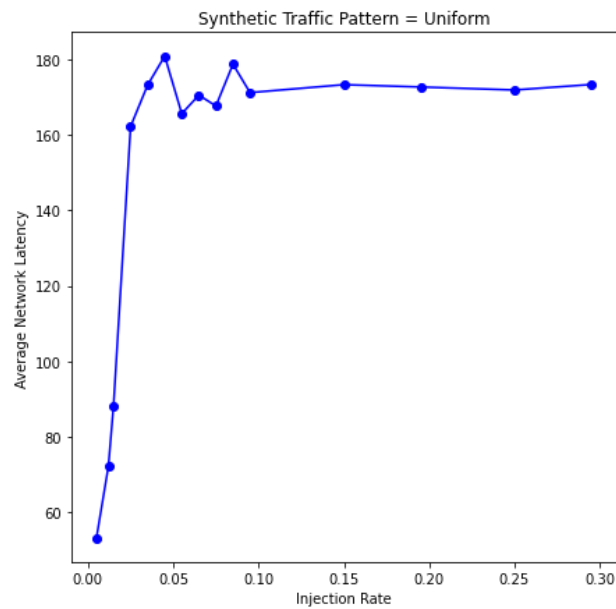
3 Question 3

Graphs:

- Synthetic Traffic Pattern : Transpose



- Synthetic Traffic Pattern : Uniform



Some Screenshots of Question3:

```
abhishek@Development: ~/booksim2/doc
// CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO, PROCUREMENT OF
// SUBSTITUTE GOODS OR SERVICES; LOSS OF USE, DATA, OR PROFITS; OR BUSINESS
// INTERRUPTION) HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER IN
// CONTRACT, STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE)
// ARISING IN ANY WAY OUT OF THE USE OF THIS SOFTWARE, EVEN IF ADVISED OF THE
// POSSIBILITY OF SUCH DAMAGE.

// 8x8 mesh with 20 flits per packet under injection mode
// injection rate here is packet per cycle, NOT flit per cycle

// Topology
topology = mesh;
k = 8;
n = 2;

// Routing
routing_function = dor;

// Flow control
num_vcs = 8;
vc_buf_size = 8;
wait_for_tail_credit = 1;

// Router architecture
vc_allocator = islip;
sw_allocator = islip;
alloc_iters = 1;

credit_delay = 2;
routing_delay = 0;
vc_alloc_delay = 1;
sw_alloc_delay = 1;

input_speedup = 2;
output_speedup = 1;
internal_speedup = 1.0;

// Traffic
traffic = uniform;
packet_size = 20;

// Simulation
sim_type = latency;
injection_rate = 0.055;
abhishek@Development:~/booksim2/src$
```

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abhishek@Development: ~/booksim2/src

abhishek@Development: ~/booksim2/doc

```
// Traffic
traffic = transpose;
packet_size = 20;

// Simulation
sin_type = latency;
injection_rate = 0.055;

END Configuration File: examples/nesh88_lat
Class 0:
Packet latency average = 261.391
    minimum = 25
    maximum = 905
Network latency average = 134.688
    minimum = 25
    maximum = 803
Slowest packet = 119
Flit latency average = 87.3341
    minimum = 6
    maximum = 818
Slowest flit = 5407
Fragmentation average = 58.288
    minimum = 0
    maximum = 199
Injected packet rate average = 0.019
    minimum = 0.005 (at node 3)
    maximum = 0.05 (at node 0)
Accepted packet rate average = 0.0157344
    minimum = 0.003 (at node 23)
    maximum = 0.049 (at node 0)
Injected flit rate average = 0.372391
    minimum = 0.008 (at node 50)
    maximum = 0.994 (at node 18)
Accepted flit rate average = 0.329797
    minimum = 0.06 (at node 23)
    maximum = 0.988 (at node 18)
Injected packet length average = 19.5995
Accepted packet length average = 20.9603
Total in-flight flits = 3213 (0 measured)
latency change = 1
throughput change = 1
Average latency for class 0 exceeded 500 cycles. Aborting simulation.
Too many sample periods needed to converge
Simulation unstable, ending ...
Total run time 0.187496
abhishek@Development:~/booksim2/src$
```

4.1 Topologies 6

4.1 Topologies

The topology parameter determines the underlying topology of the **network**. There is also a set of numerical parameters that describes the size of the **networks**.

k **Network** radius, the number of routers per dimension

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abhishek@Development: ~/booksim2/src

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```
// Traffic
traffic = uniform;
packet_size = 20;

// Simulation
sin_type = latency;
injection_rate = 0.055;

END Configuration File: examples/nesh88_lat
Class 0:
Packet latency average = 339.222
    minimum = 25
    maximum = 833
Network latency average = 165.724
    minimum = 25
    maximum = 508
Slowest packet = 76
Flit latency average = 95.1024
    minimum = 6
    maximum = 482
Slowest flit = 8859
Fragmentation average = 92.3188
    minimum = 0
    maximum = 332
Injected packet rate average = 0.0240156
    minimum = 0.012 (at node 29)
    maximum = 0.036 (at node 31)
Accepted packet rate average = 0.01975
    minimum = 0.011 (at node 43)
    maximum = 0.027 (at node 9)
Injected flit rate average = 0.473797
    minimum = 0.236 (at node 29)
    maximum = 0.719 (at node 46)
Accepted flit rate average = 0.422203
    minimum = 0.256 (at node 43)
    maximum = 0.586 (at node 27)
Injected packet length average = 19.7287
Accepted packet length average = 21.3774
Total in-flight flits = 3719 (0 measured)
latency change = 1
throughput change = 1
Average latency for class 0 exceeded 500 cycles. Aborting simulation.
Too many sample periods needed to converge
Simulation unstable, ending ...
Total run time 0.339651
abhishek@Development:~/booksim2/src$
```

4.1 Topologies 6