MidSem Project
Warp State Analysis

Team members:

Ishan Mardani (21CS01023)

Akshit Dudeja (21CS01026)

Tushar Joshi(21CS01078)

Vishnu Tirth Bysani (21CS01077)

Joshua Dias Barreto (21CS01075)

Warp States

When a kenel executes on an SM, warps of the kenel can be in different states.

We classify the warps depending on their state of execution in a given cycle:

Issued:

Warps that issue an instruction to the execution pipeline are accounted here. It indicates the IPC of the SM and a high number of warps in this state indicate good performance

Waiting:

Warps waiting for an instruction to commit so that further dependent instructions can be issued to the pipeline are in this category.

Excess ALU (XALU):

Warps that are ready for execution of arithmetic operations, but cannot execute due to unavailability of resources are in this category. These are ready to execute warps and cannot issue because the scheduler can only issue a fixed number of instructions per cycle. Xalu indicates the excess warps ready for arithmetic execution.

Excess Memory (XMEM):

Warps that are ready to send an instruction to the Load/Store pipeline but are restricted are accounted here. These warps are restricted if the pipeline is stalled due to back pressure from memory or if the maximum number of instructions that can be issued to this pipeline have been issued. Xmem

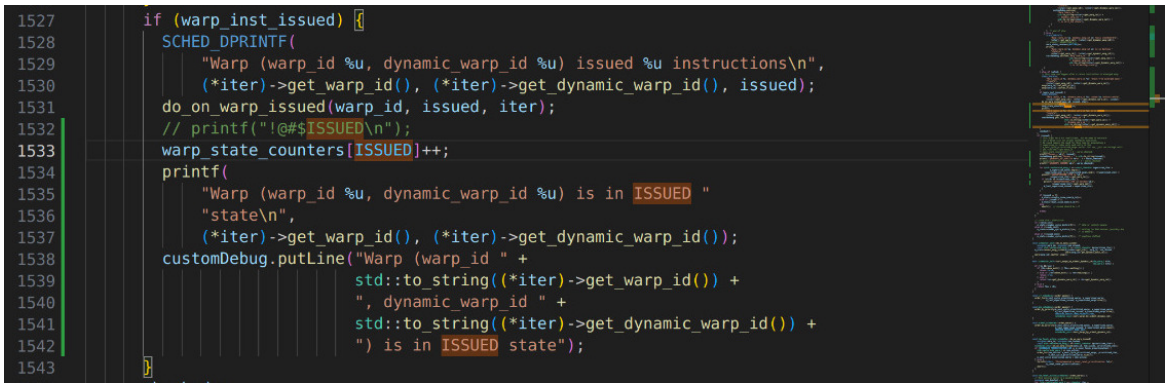
warps represents the excess warps that will increase the pressure on the memory subsystem from the current SM.

Other:

Warps waiting on a synchronisation instruction or warps that do not have their instructions in the instruction buffer are called Others. As there is no for these warps, their requirements is unknown.

Modifications in Codebase

Issued State Counter:



```
1527    if (warp_inst_issued) {
1528      SCHED_DPRINTF(
1529          "Warp (warp_id %u, dynamic_warp_id %u) issued %u instructions\n",
1530          (*iter)->get_warp_id(), (*iter)->get_dynamic_warp_id(), issued);
1531      do_on_warp_issued(warp_id, issued, iter);
1532      // printf("!@#$ISSUED\n");
1533      warp_state_counters[ISSUED]++;
1534      printf(
1535          "Warp (warp_id %u, dynamic_warp_id %u) is in ISSUED "
1536          "state\n",
1537          (*iter)->get_warp_id(), (*iter)->get_dynamic_warp_id());
1538      customDebug.putLine("Warp (warp_id " +
1539                          std::to_string((*iter)->get_warp_id()) +
1540                          ", dynamic_warp_id " +
1541                          std::to_string((*iter)->get_dynamic_warp_id()) +
1542                          ") is in ISSUED state");
1543    }
```