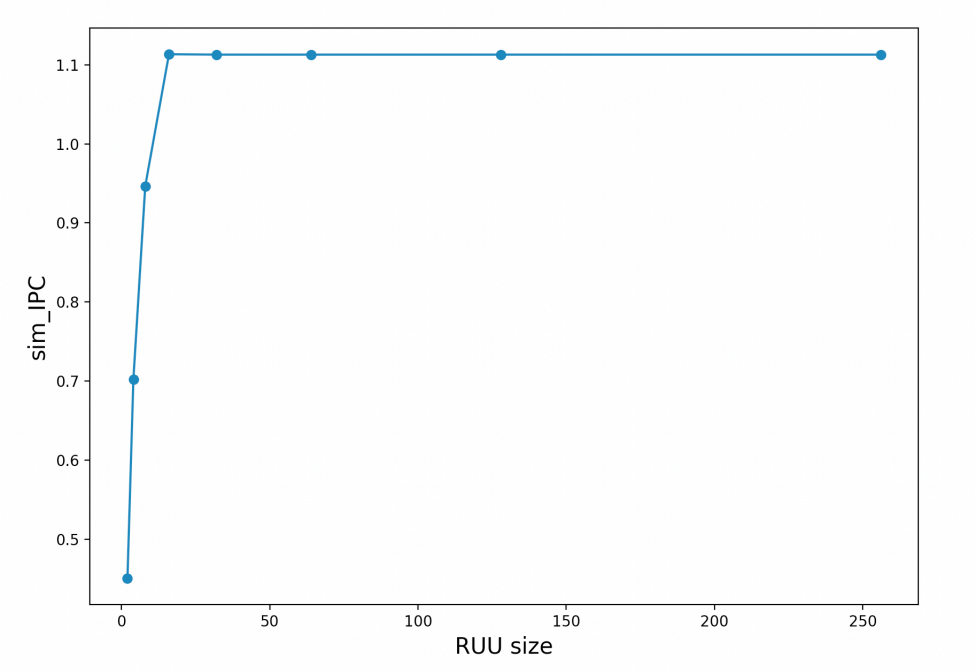
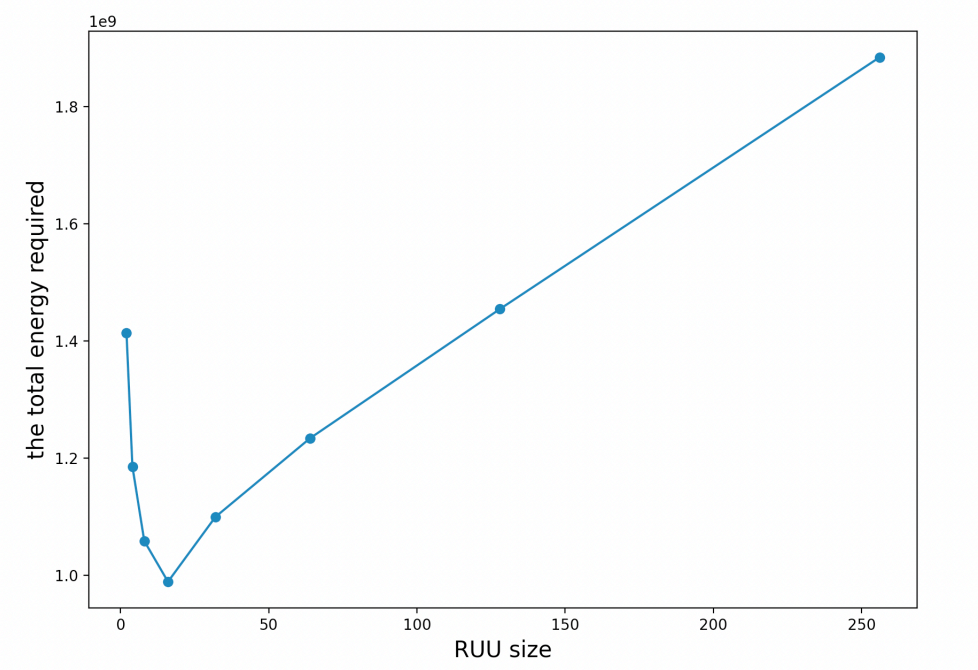
Vary the RUU size between 2 and 256 (only powers of two are valid):



sim_IPC: increases at first, the stay the same-> when the RUU is too small, making it bigger makes the program run much faster. But at some point, increasing RUU size stops helping.

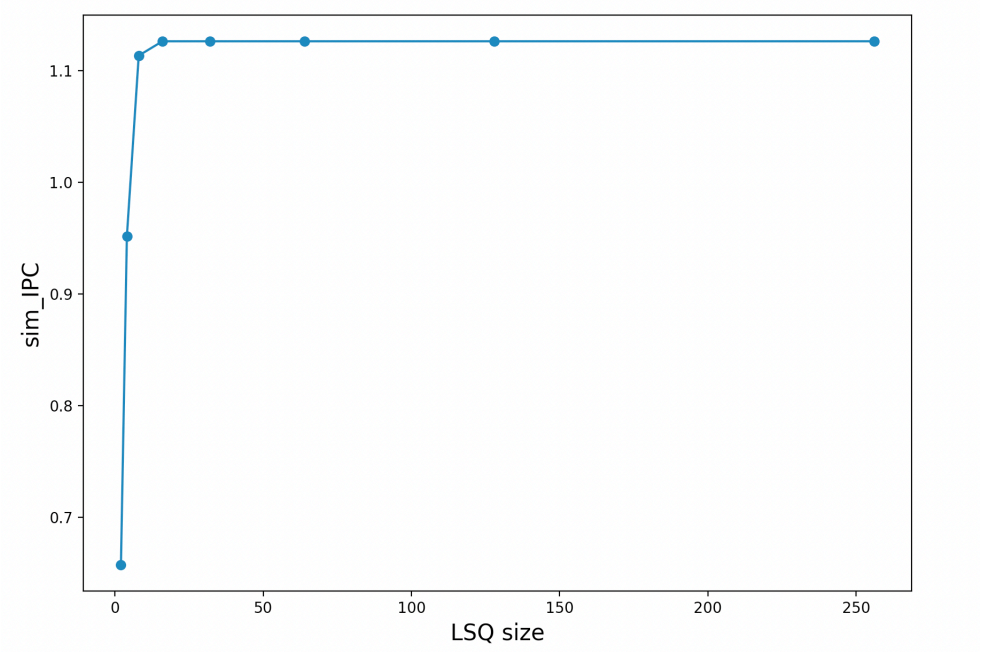


total energy consumed: decrease then increase -> increasing RUU size does cost energy. So making the RUU bigger than necessary leads to a fast execution time, but an unnecessarily high energy consumption

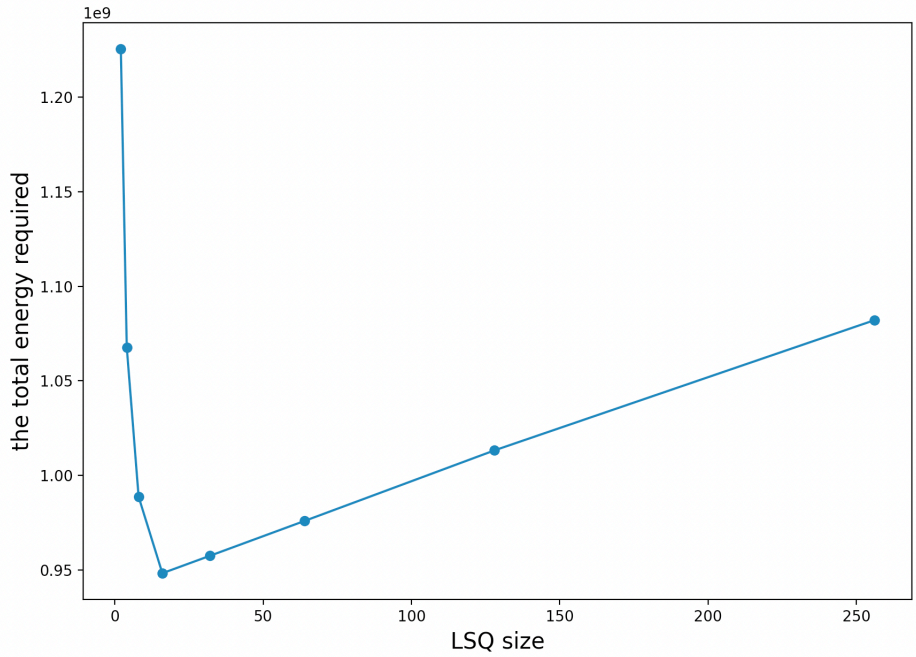
//the energy modeling mode we use by default assumes that all the available units are always on and running

//unravel the two factors: how much energy does it cost, and what effect does it have on execution time.

Vary the LSQ size between 2 and 256 (only powers of two are valid):



Sim_IPC: same as ruu



total energy consumed:same as ruu

What microarchitectural structure is limiting the simulated execution speed when running this application in the default simulated architecture? Under what circum- stances is it the RUU size? Under what circumstanes is it the LSQ size?

-- RUU handles register synchronization/communication

– unifies reorder buffer and reservation stations • managed as a circular queue • entries allocated at Dispatch, deallocated at Commit

– out-of-order issue, when register and memory deps satisfied • memory dependencies resolved by load/store queue (LSQ)

LSQ handles memory synchronization/communication

– contains all loads and stores in program order • load/store primitives really, address calculation is separate op • effective address calculations reside in RUU (as ADD insts)

– loads issue out-of-order, when memory deps known satisfied • load addr known, source data identified, no unknown store address

when ruu <= lsq size,

when ruu>= lsq size,

What combination of RUU size and LSQ size leads to the lowest total energy comsumption to complete the computation?

-- the lowest total energy comsumption: RUU size = LSQ size = 16

-> minimising execution time(min when ruu = 256, lsq = 128, the sim_IPC(indicate the exec time) here = 2.0637, but the energy comsuption here is extremely large(= 1499931696.4137)) does not minimise energy consumption(min when ruu = lsq = 16, the sim_IPC here = 1.1261).

find the simple-scalar configuration which finishes the computation in the minimum total energy:

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