

MTCS-102(P)

# Advanced Architecture

## Assignment -2

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### Problem Description

Explore following compilers from Compiler Explorer for the Bubble\_sort.c program and note down the number of instructions of each case. Then take a benchmark program and calculate number of instructions with respect to various compilers

<b><u>Compiler</u></b>	<b><u>No of Instructions</u></b> <b><u>QuickSort</u></b>	<b><u>No. of Instructions</u></b> <b><u>Benchmark Instruction</u></b>
RISC - V rv32gc	217	547
MIPS64 gcc 5.4	321	769
X86 clang 12.0.0	188	456
ARM gcc 8.2	203	453
RISC - V rv32gcc clang(trunk)	217	547
RISC - V rv64gcc clang(trunk)	220	629

### Observations:

1. When using Bubble Sort code, the x86-64 CISC-based compiler produces less instructions than the benchmark application making it adequately optimised for particular activities. In case of benchmark workload, it might need more instructions.
2. In the observation above, we saw that the RISC based compilers produce almost the same number of instructions for Bubble Sort. This implies that RISC-V architecture offers consistent performance for the benchmark workload as well as the particular task.
3. In the table, it is seen that the ARM- based compiler is effective for particular small programs but when the working comes for benchmark codes , it requires more instructions.
4. For MIPS compilers, we see that the architecture may not be as well optimised for the particular tasks and may need more instructions to complete the benchmark workloads.

### Conclusion:

When it comes to performance optimization for particular jobs and benchmark workloads, each architecture has strengths and weaknesses. Compilers based on the x86-64 CISC architecture might be effective for some tasks, but they might not scale well for workloads that are more complicated. A dependable option, RISC-V architecture appears to offer consistent performance across many tasks. Small programs may benefit greatly from ARM-based compilers, while resource-intensive activities may not run as smoothly. Finally, the MIPS architecture could be unable to handle some workloads effectively. Based on the specific requirements and nature of the tasks being carried out, the best architecture should be chosen.