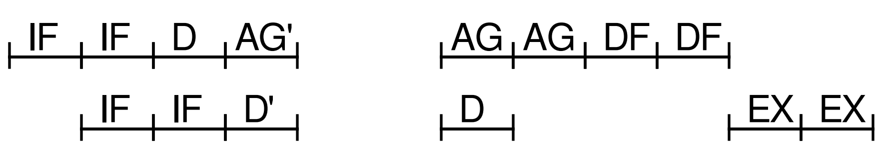
CSE471 AQ Snyder

Review Questions

1. Find in the table for a scientific workload the observed percentage of branches in instruction streams for L/S, R/M and R+M architectures. Can you explain why the numbers show the trend that they do? Is this pattern consistent across other workloads?
2. How many intruction words are required to represent the statement `A:=B+C` in L/S, R/M and R+M programs. (Hint: Table 1.17 might be useful.)
3. Given the statistics for the average number of instructions between procedure calls and returns in C programs, compute how much register windows would save assuming (a) they work "perfectly", i.e. take no time to shift and never overflow, and (b) that they eliminate all costs due to parameter passing, register save/restores and value returning.
4. In table 3.7 suppose the VAX and the MIPS R2000 take the exact same number of cycles to perform the four systems operations (its almost certainly not true), and that the MIPS has a CPI of 1.5 for these instructions. What is the VAX CPI for each type of system operation?
5. What is instruction run-length? What is average instruction length for R/M machines. Would one expect it to be larger or smaller for an L/S machine.
6. Suppose that for LISP programs the branch classes are --

BC, BR, BCR, BRR	52.4
Loop control	7.1
Procedure	40.5

and all other ratios are the same. Compute the fraction of all branches that go to their target. What fraction of all branches compute an effective address?
7. What is contained in a "centered branch table"? How many of them would there be for an L/S architecture to be at least 50% effective?
8. What percentage of the instructions in a program depend for their execution on data values computed in the previous three instructions? If 53% of the instructions will reference such data, what is the increase in CPI if the data references up to 3 instructions back delay the pipeline?
9. Draw a timing template for the R2000 like processor used in CSE378 assuming cache reference takes 2 clock cycles.
10. Assess the delay caused by BC instructions for the template in (9).
11. Assess the delay caused by data dependencies (assuming no forwarding).
12. What is the CPI increase due to dependences in problems (10) and (11).
13. What is delaying the decode in the second instruction?



14. Branch delays have been claimed to be a good idea. Why?
15. What is a run-on instruction? Give examples.