

Quiz

- Frequency of ALU instructions: 40%
- Frequency of data transfer instructions: 35%
- Frequency of branch instructions: 25%
- ALU instructions take 2 cycles, data transfer instructions take 3 cycles, branch instructions take 3 cycles.
- Enhancement A: reduce ALU instructions to 1 cycle
- Enhancement B: reduce data transfer and branch instructions to 2 cycles
- Apply Amdahl's Law to compute the performance speedup for each method.
- Which is better?

- The fraction of execution time of ALU instructions

$$\frac{40\% \times 2}{40\% \times 2 + 35\% \times 3 + 25\% \times 3} = \frac{0.8}{2.6} = 31\%$$

- The fraction of execution time of other instructions

$$\frac{40\% \times 2}{40\% \times 2 + 35\% \times 3 + 25\% \times 3} = \frac{0.8}{2.6} = 69\%$$

■ Enhancement A:

$$\frac{1}{(1 - 0.31) + \frac{0.31}{2}} = 1.18$$

■ Enhancement B:

$$\frac{1}{(1 - 0.69) + \frac{0.69}{1.5}} = 1.3$$