

Formulas:

$$\#cores \cdot clock\ speed \cdot \frac{FMA}{cycle} \cdot \# \frac{flops}{FMA}$$

FLOPs

$$\#cores \cdot clock\ speed \cdot \frac{VPADDB}{cycle} \cdot \frac{iops}{VPADDB}$$

IOPs

Use the VFMADD132PS instruction: Fused Multiply Add, $c \leftarrow a \cdot b + c$, used on AVX register

$\frac{FMA}{cycle} = 2$, the number comes from the reciprocal (inverse) throughput column, which reads 0.5, and inverting this value gives you $\frac{1}{\frac{1}{2}}$, which comes out to 2 FMA instructions per cycle

$\frac{flops}{FMA} = 16$, 256-bit registers in AVX2, floats are single-precision, meaning 32 bits, so 8 floats per AVX2 register, but FMA instruction is multiply & add, each of which require 8 floats, so # floating point operations adds up to 16 in total

Use the VPADDB instruction

$\frac{VPADDB}{cycle} = 3$, comes from reciprocal (inverse) throughput column value which reads 0.33

$\frac{iops}{VPADDB} = 32$, 256-bit registers in AVX2, integers are stored as 8 bits long, so 32 integers per AVX2 register, which means # integer operations comes up to 32 in total

1. My laptop computer contains an AMD Ryzen 7 4800H CPU based on AMD's Zen 2 architecture

$$2. \left(\frac{\text{Flops}}{\text{sec}} \right)_{\text{calc}} = 8 \text{ cores} \cdot 2.9 \times 10^9 \cdot 2 \cdot 16 = 742.4 \times 10^9 \text{ Flops}_{\text{calc}},$$

$$\left(\frac{\text{Flops}}{\text{sec}} \right)_{\text{exp}} \approx 8.92079 \times 10^{11} \text{ Flops}_{\text{exp}},$$

$$\text{efficiency} = \frac{\left(\frac{\text{Flops}}{\text{sec}} \right)_{\text{exp}}}{\left(\frac{\text{Flops}}{\text{sec}} \right)_{\text{calc}}} = \frac{8.92079 \times 10^{11}}{742.4 \times 10^9} = 1.20161 \approx 120\%$$

$$3. \left(\frac{\text{Iops}}{\text{sec}} \right)_{\text{calc}} = 8 \text{ cores} \cdot 2.9 \times 10^9 \cdot 3 \cdot 32 = 2227.2 \times 10^9 \text{ Iops}_{\text{calc}},$$

$$\left(\frac{\text{Iops}}{\text{sec}} \right)_{\text{exp}} \approx 2.36248 \times 10^{12} \text{ Iops}_{\text{exp}},$$

$$\text{efficiency} = \frac{\left(\frac{\text{Iops}}{\text{sec}} \right)_{\text{exp}}}{\left(\frac{\text{Iops}}{\text{sec}} \right)_{\text{calc}}} = \frac{2.36248 \times 10^{12}}{2227.2 \times 10^9} = 1.06073 \approx 106\%$$