1 For each byte

time for copy one byte to buffer: 1 tick

polling : 200 ticks

sum = 201 tick

So the total time take for polling:

10^6 bytes × 201 tick = 2.01×10^8 ticks

2 The number of times the buffer can be fully used:

1×10^6 bytes / 10k bytes = 100 times

For each time:

read start address: 1 tick

read number of bytes to read: 1 tick

Interrupt : 500 ticks

copy : 10000 ticks

clear buffer : 1 tick

instruct driver to keep read : 1 tick

sum = 10504 tick

so the total for interrupt = 10504 × 100 = 1050400 ticks

3 Percentage of processing time

polling: $\frac{2.01 \times 10^8 \text{ ticks}}{500 \times 10^6 \text{ ticks}} = 40.2\%$

Interrupt: $\frac{1050400 \text{ ticks}}{500 \times 10^6 \text{ ticks}} = 0.2101\%$

The Percentage of processing time of polling is much bigger than Interrupt

a The polling loes all its time when the cpu wait for the disk to be ready

The Interrupt loes all its time when copy data from buffer to RAM and when buffer waits the processor ready to be interrupt

4. a CPU instruct the DMA controller : 1 tick

DMA overhead : 1000 ticks

Transfer data : 10^6 ticks (by DMA)

DMA interrupt cpu to say "dave" : 500 ticks

total time: 100150 ticks

b $\frac{1501 \text{ ticks}}{500 \times 10^6 \text{ ticks}} = 0.0003\%$

c $\frac{100150 \text{ ticks}}{500 \times 10^6 \text{ ticks}} = 0.2003\%$

d when the DMA waits the processor ready to be interrupt

e since the impact on percentage of processing time of DMA is smaller than that of polling and Interrupts, DMA is the best way to reduce the loss of cpu in transferring files