Solutions

2.1

- $4\,\mu s / 12.5\,ns = 320$ polls ✓.

2.2

- Interrupts – rare human-paced events ✓.

2.3

- DMA – streaming blocks ✓.

3.1

- Polls per sample: $8\,\mu s / 25\,ns = 320$ (one poll $= 100 \times 250$ ps $= 25$ ns) ✓.
- Polling attention: $320 \times 100 = 32\,000$ cycles per sample ✓.
- Interrupt attention: 400 cycles per sample – $80\times$ less ✓.
- Sampling at a fixed rate fits polling only if the loop is dedicated; with any other work, interrupts win – the criterion is whether the CPU has anything else to do ✓.

3.2

- Per-word interrupts: $2048 \times 200 = 409\,600$ cycles ✓.
- DMA: $600 + 200 = 800$ cycles; ratio $409\,600/800 = 512\times$ ✓.
- Under 1% of $200 \times n$ cycles with one 800-cycle DMA bill: $800 < 0.01 \times 200n \Rightarrow n > 400$ words per interrupt ✓.
- Under DMA the CPU still pays the setup, the completion handling, and cache-coherence care – the data path, not the data movement ✓.

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