

## Chapter 4

# “Zihintpause” Pause Hint, Version 1.0

The PAUSE instruction is a HINT that indicates the current hart’s rate of instruction retirement should be temporarily reduced or paused. The duration of its effect must be bounded and may be zero. No architectural state is changed.

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*Software can use the PAUSE instruction to reduce energy consumption while executing spin-wait code sequences. Multithreaded cores might temporarily relinquish execution resources to other harts when PAUSE is executed. It is recommended that a PAUSE instruction generally be included in the code sequence for a spin-wait loop.*

*A future extension might add primitives similar to the x86 MONITOR/MWAIT instructions, which provide a more efficient mechanism to wait on writes to a specific memory location. However, these instructions would not supplant PAUSE. PAUSE is more appropriate when polling for non-memory events, when polling for multiple events, or when software does not know precisely what events it is polling for.*

*The duration of a PAUSE instruction’s effect may vary significantly within and among implementations. In typical implementations this duration should be much less than the time to perform a context switch, probably more on the rough order of an on-chip cache miss latency or a cacheless access to main memory. Portable software should not use more than one PAUSE instruction before re-evaluating loop conditions, else performance might substantially degrade on other implementations, or even on some executions on the same implementation.*

PAUSE is encoded as a FENCE instruction with  $pred=W$ ,  $succ=0$ , and  $fm=0$ .

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*PAUSE is encoded as a hint within the FENCE opcode because some implementations are expected to deliberately stall the PAUSE instruction until outstanding memory transactions have completed. Because the successor set is null, however, PAUSE does not mandate any particular memory ordering—hence, it truly is a HINT.*

*Like other FENCE instructions, PAUSE cannot be used within LR/SC sequences without voiding the forward-progress guarantee.*

*The choice of a predecessor set of W is arbitrary, since the successor set is null. Other HINTs similar to PAUSE might be encoded with other predecessor sets.*