Legacy instructions

The arm64 port of the Linux kernel provides infrastructure to support emulation of instructions which have been deprecated, or obsoleted in the architecture. The infrastructure code uses undefined instruction hooks to support emulation. Where available it also allows turning on the instruction execution in hardware.

The emulation mode can be controlled by writing to sysctl nodes (/proc/sys/abi). The following explains the different execution behaviours and the corresponding values of the sysctl nodes -

- Undef
  Value: 0

  Generates undefined instruction abort. Default for instructions that have been obsoleted in the architecture, e.g., SWP

- Emulate
  Value: 1

  Uses software emulation. To aid migration of software, in this mode usage of emulated instruction is traced as well as rate limited warnings are issued. This is the default for deprecated instructions, .e.g., CP15 barriers

- Hardware Execution
  Value: 2

  Although marked as deprecated, some implementations may support the enabling/disabling of hardware support for the execution of these instructions. Using hardware execution generally provides better performance, but at the loss of ability to gather runtime statistics about the use of the deprecated instructions.

The default mode depends on the status of the instruction in the architecture. Deprecated instructions should default to emulation while obsolete instructions must be undefined by default.

Note: Instruction emulation may not be possible in all cases. See individual instruction notes for further information.

Supported legacy instructions

- SWP{B}

Node: /proc/sys/abi/swp
Status: Obsolete
Default: Undef (0)

- CP15 Barriers

Node: /proc/sys/abi/cp15_barrier
Status: Deprecated
Default: Emulate (1)

- SETEND

Node: /proc/sys/abi/setend

Status: Deprecated

Default: Emulate (1)*

Note: All the cpus on the system must have mixed endian support at EL0 for this feature to be enabled. If a new CPU - which doesn't support mixed endian - is hotplugged in after this feature has been enabled, there could be unexpected results in the application.