

## Sep 28, 2023 | 📅 RISC-V Control Transfer Records TG Meeting

Attendees: tech.meetings@riscv.org Beeman Strong Bruce Ableidinger

### Notes

- **Attendees:** Beeman, JohnS, AllenB, BruceA, Snehasish, Rajnesh
- **Slides/video** [here](#)
- Internal review is one week in, feedback from AllenB and GregF so far
- Lots of requests for clarifications or wording changes that I'm not covering today
- Eliminating mctrstatus CSR in favor of only sctrstatus, since the latter was passing through all bits anyway
  - M-mode can always access s\* CSRs
- Moving FROZEN and WRAP bits in mctrstatus to the MSBs
  - Preserves for contiguous bits for future fields
  - Allen: easier to test as well
- DEPTH encoding discussion
  - Current field is 4 bits, only encodings with consecutive bits are defined. Allen asked why we don't use a denser, 3-bit field
  - 3-bit encoding can be just as good for discovery, as long as we have requirements for how reserved/unsupported encodings are converted (since WARL)
  - Allen: why don't we require smallest depth? Would simplify 3-bit encoding, then all converted values go to max supported value.
  - Allen: why not always use max depth?
    - Beeman: to reduce context switch cost, and to support VM migration between implementations with different depths
    - Allen: you should put that in the spec
  - Agreed to switch to 3-bit encoding, and require min value
- Cycle counting
  - Greg asked if it wouldn't be better to have a simple 27-bit counter, and stick the full value in the record
  - Looking at tradeoffs between compressed and uncompressed cycle values
  - Allen: for compressed, shifters aren't cheap
  - Beeman: my designers said they prefer the extra logic for compressed vs extra area (11 bits per entry) for uncompressed
  - Agreed to stick with encoded cycle delta
- Hypervisor CTR management
  - HV has to save/restore CTR state if allowing a guest to use CTR, if host or another guest is using CTR
    - Adds overhead, so only want to do so when guest is actively using CTR
  - Can detect guest start of CTR use by clearing hstateen0.CTR, trap on first guest access to CTR

- Propose DIRTY bit to help determine when guest is done. Set if CTR buffer may be non-zero
- On VM-exit, if guest CTR state has DIRTY=0, HV can assume guest is done
- Allen: have something similar for FP regs. Look at how FS and VS work.
  - May need to reflect these bits in mstatus.XS field. For use by an OS.
  - Allow DIRTY to be RO1
- Beeman to look at FS/VS mechanism, and review this with hypervisor reps

Action items

