



code size reduction

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# Agenda

1. SIG + TG
2. Hi3861 WiFi-IoT + HCC download (includes PUSH/POP)
3. ISA extension status
4. Next meeting: 2<sup>nd</sup> March at 7am PDT

# SIG + TG

- Code-size TG continues
  - produce RVM22 ISA extension
  - then possibly RVM23 ISA extension?
- Code-Optimization needs to be a SIG
  - no fixed deliverables, unlike a TG
  - researching different topics
  - can spawn TGs as requirements come to light
  - can continue in the same meeting slot
  - I'm overcommitted, and can't chair it ☹

# WiFi-IoT and HCC

- Huawei Hi3861 platform WiFi-IoT code can be downloaded
  - and you can buy the board on Taobao
  - <https://item.taobao.com/item.htm?spm=a1z10.3-c.w4002-18447093278.24.46a24c57weAWXH&id=622343426064>
- HCC download (includes PUSH/POP)
  - [https://gitee.com/hihopeorg/gcc\\_compiler\\_riscv](https://gitee.com/hihopeorg/gcc_compiler_riscv)
- HarmonyOS download
  - [https://device.harmonyos.com/en/docs/start/get-code/oem\\_sourcecode\\_guide-0000001050769927](https://device.harmonyos.com/en/docs/start/get-code/oem_sourcecode_guide-0000001050769927)
- Should give similar results to Huawei IoT code, but is freely downloaded
- I'll put instructions on github.....

# ISA Extension Roadmap

1. Try to close the ISA extension within the next 4 weeks
  1. Discuss the status at the next two code-size meetings
  2. Have a final short-list within the next 4 weeks
  3. Benchmarking / refinement will continue
  4. I expect to remove instructions / functionality not add more after this point
  5. Need to work out how to spend the encoding space
    1. leave enough for future extensions
    2. get the largest saving in the smallest encoding space
    3. it's going to be tough to workout the best tradeoffs
  6. Need to get ratified this year!!

# ISA Extension Shortlist (1)

- PUSH/POP
  - PUSH optionally includes S to A moves
  - C.PUSH auto-moves S to A depending on the register list
  - POPRET optionally moves 0 / 1 / s0 into a0
  - C.POPRET optionally moves 0 into a0
    - the most common in the benchmark suite
- Table Jump
  - jump table most only
    - vector table / emulation listed as future options
- Register moves
  - <https://github.com/riscv/riscv-code-size-reduction/tree/master/ISA%20proposals/Huawei>
  - Generic move vs C.MV01S0[37] and C.MV23S0[37]
  - Generic is not tied to the ABI, but takes a lot more encoding space



# ISA Extension Shortlist (2)

- C.LHU/C.LBU/C.SH/C.SB
  - 4-bit immediate is enough (Huawei implemented 5-bit on hardware, mirroring C.FLD etc.)
    - each takes 11-bits of operands, 2 3-bit reg specifiers and 5-bit immediate
  - this leaves a lot of extra encoding space – 4 x 10-bits compared to 5-bit immediates x 4 instructions
  - signed byte/loads seem rare, including in the whole Debian distro
  - ~3% saving on Huawei IoT for 4 encodings with 10-bits of operands, seems expensive though.....
- C.LHUSP/C.LBUSP/C.SHSP/C.SBSP
  - SP relative versions with 4-bit immediate
  - No estimate yet
- C.DEC[1248]BGEZ
  - Loop optimisations, dec-and-branch
  - No estimate yet
- LWGP/SWGP/Load-zero page
  - No estimate yet

# ISA Extension Shortlist (3)

- Simple instructions
  - C.[SZ]EXT.[BH]
  - C.NOT
  - C.MUL
  - C.LSBNOT
- B-extension
  - Look for a B-extension subset to include in the ISA extension



# Thank You

