C Forth on the RP2350? Yes, Please!

M. Edward (Ed) Borasky

Silicon Valley Forth Interest Group

2024-09-28

A (Welcome) Surprise in the (E)mail

August 8, 2024 - the Raspberry Pi Pico 2 is announced

- *Raspberry Pi Pico 2, our new $5 microcontroller board, on sale now*
- *Our RP2350 Partners made all this excellent stuff for you*
- *What's new in Raspberry Pi Pico 2*
- *RP2350: the brains of Raspberry Pi Pico 2*

Pico vs. Pico 2

	Pico	Pico 2
Processor	RP2040	RP2350
On-chip SRAM	256 KiB + 8 KiB	512 KiB + 8 KiB
Flash	2 MiB	4 MiB
Price (Quantity 1)	$4US	$5US

RP2040 vs. RP2350

	RP2040	RP2350
CPU	Arm Cortex M0+	Arm Cortex M33
Default clock	133 MHz	150 MHz
Cores	2	2 *
Integer divide	co-processor	machine instruction
32-bit floats	software	machine instructions
64-bit floats	software	co-processor
DSP instructions	no	yes
PSRAM support	no	yes

About that *

- The RP2350 actually has four cores!
- The two Arm Cortex M33 cores you know about, and
- Two *RISC-V Hazard3* cores
- At boot time, you can boot up any two of the four cores.

So I bought a few partner boards

- *Pimoroni Pico Plus 2*
  - 16 MiB flash, 8 MiB of PSRAM
- *SparkFun Pro Micro - RP2350*
  - 16 MiB flash, 8 MiB of PSRAM
- *iLabs Challenger+ RP2350 BConnect*
  - 8 MiB flash, 8 MiB PSRAM
- *iLabs Challenger+ RP2350 WiFi6/BLE5*
  - 8 MiB flash, 8 MiB PSRAM, WiFi and Bluetooth!

The CLAMS Development Environment

A collection of command-line Linux tools

- *Raspberry Pi Pico-series C/C++ SDK*
- *Raspberry Pi Pico Python SDK*
- *CircuitPython*
- *Arduino-Pico*
- *PlatformIO Core (CLI)*
- Coming soon! *Zephyr*

A container to run them in!

- Many third parties have limited testing resources
- If they support Linux at all, it's RHEL (expensive), or
- Ubuntu 22.04 LTS aka "Jammy Jellyfish"
- So I built a *Distrobox* container running Ubuntu 22.04 LTS
- Hosted on *Universal Blue Bluefin*
- (But any Distrobox host will work - any recent Linux distro)

C Forth

Why C Forth?

URL: *https://github.com/MitchBradley/cforth*

- Optimized for microcontrollers
- Comprehensive - derived from Mitch Bradley's Open FirmWare
- Extensible in either C or Forth!
- Portable - I want to run Forth on other microcontrollers
- Linux build process is straightforward using PlatformIO

Demo

Questions?

Questions?

My email: *znmeb@algocompsynth.com*