Getting Started Embedded Rust on micro:bit v2

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Introduction to micro:bit v2

microbit.org PLEASE USE only microbit v2(!)

- Nordic nRF52833 ARM Cortex-M4
- Peripherals on board:
  - 5x5 LED matrix,
  - Buttons,
  - GPIOs,
  - Accelerometer,
  - Bluetooth,
  - Crocodile Clips, Light Sensor, Speaker, Microphone, External Power,
  - etc.

Live Demonstration

- Create Project

```
cargo generate microbit-rust-nostd \
   --name myproject
# or remote
cargo generate \
   --git https://github.com/br0kenpixel/microbit-rust-nostd
```

- Connect microbit USB-C cable
- Run (build and flash)

```
cargo run
```

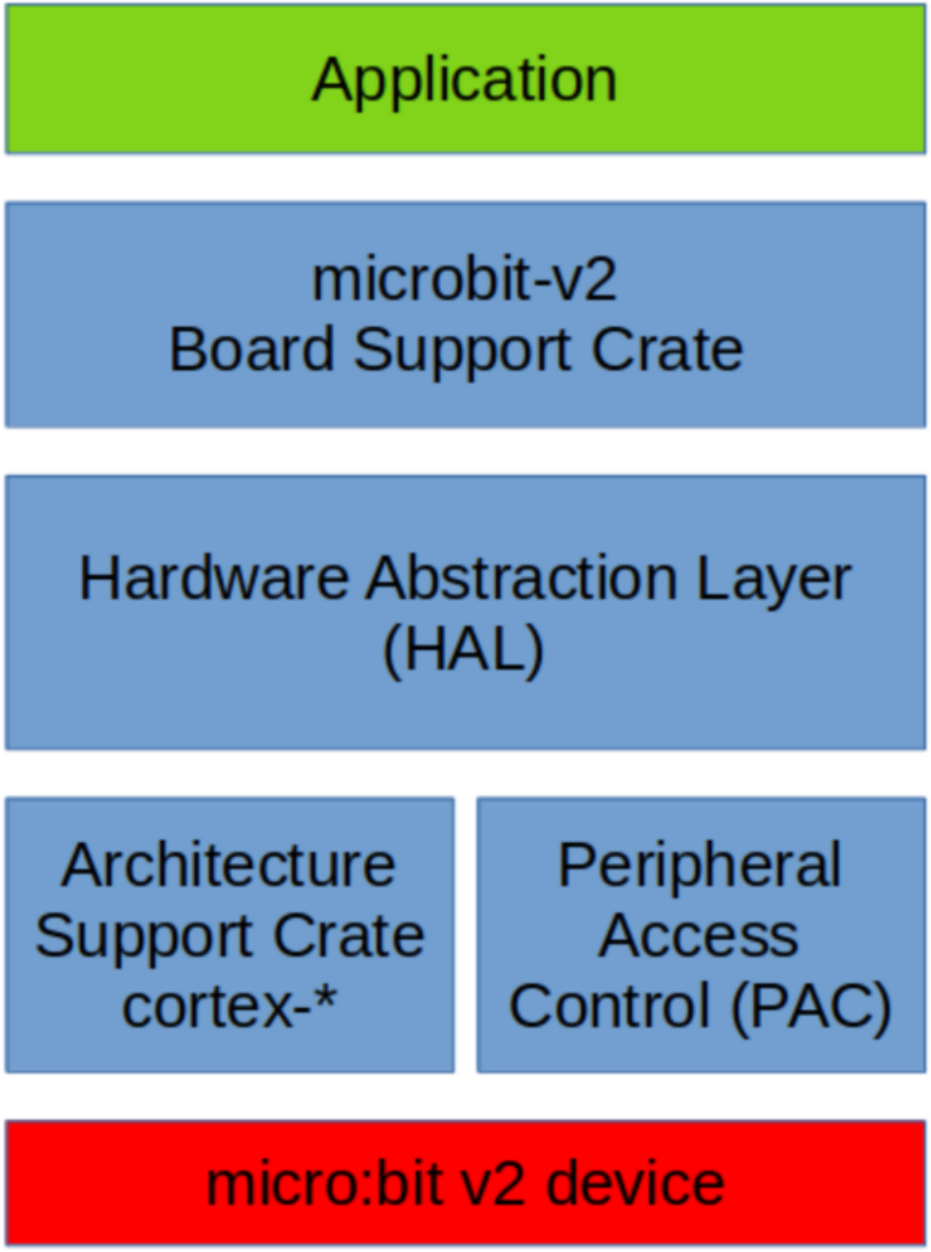
Setting up the Development Environment

Platform specific parts

https://docs.rust-embedded.org/discovery/microbit/03-setup/index.html

```
# rustup (rust version > 1.57)
rustc -V
# cargo-binutils
rustup component add llvm-tools-preview
cargo install cargo-binutils --vers 0.3.3
# cargo-embed
cargo install cargo-embed --vers 0.11.0
```

Rust Embedded Architecture



Walkthrough of the Created Project

- `.cargo/config` specifies runner, build target
- `Embed.toml` configures gdb, rtt
- `memory.x` describes where the RAM and FLASH are and their sizes
- `build.rs` ensures `memory.x` is in out directory

Walkthrough of the Created Project: src/main.rs

```rust
#![no_std] // core library
#![no_main] // custom entry point

use cortex_m_rt::entry;
use microbit::{board::Board, display::blocking::Display, hal::Timer};
use panic_rtt_target as _;
use rtt_target::{rprintln, rtt_init_print};

#[entry]
fn main() -> ! {
    rtt_init_print!();
    let board = Board::take().unwrap();
...
    loop {
        rprintln!("Hello!");
    }
}
```

Examples in microbit Crate

```
git clone https://github.com/nrf-rs/microbit

# example: display blocking
cargo run --release \
   --features v2 --target thumbv7em-none-eabihf \
   --manifest-path ./examples/display-blocking/Cargo.toml

# example text with Real-Time Interrupt-driven Concurrency (RTIC)
cargo run --release \
   --features v2 --target thumbv7em-none-eabihf \
   --manifest-path ./examples/display-text-rtic/Cargo.toml
```

Testing Embedded Rest

Ferrous Article Serie “Testing an embedded application”
https://ferrous-systems.com/blog/test-embedded-app/

Whenever possible you should test your firmware code on the host.

Debugging

Using GDB https://docs.rust-embedded.org/discovery/microbit/05-led-roulette/debug-it.html

`probe-rs` in vscode https://probe.rs/docs/tools/vscode/

Ressources

https://docs.rust-embedded.org/

https://github.com/rust-embedded/awesome-embedded-rust

https://docs.rust-embedded.org/discovery/microbit/

https://embedded-trainings.ferrous-systems.com

https://docs.rust-embedded.org/embedonomicon

Advanced Topics

- RTOS
- embassy: embedded async tools
- drogue-device
  - https://github.com/drogue-iot/drogue-device
  - https://book.drogue.io/drogue-device/dev/examples/nrf52/microbit/ble/README.html describes using Bluetooth on microbit for data and also supports updateing the firmware via Bluetooth