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ENSE 481

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ENSE 481 Test Plan

Requirements

- I shall configure an Nucleo-F103RB (Nucleo) for programming with its associated ST-LINK module detached for better power consumption measurements

  - Break the MCU from the ST-LINK module, connect SWD programming lines, VDD and ground connections for development and programming. When performing a test, fully disconnect the ST-LINK SWD wires, leaving only VDD and ground.

- I shall configure the Nucleo in near maximum power consumption (PC) mode to be used as an upper bound of possible PC

  - Enable all clocks, peripherals and all other functions. Enter a deadloop for a few seconds.

- I shall configure the Nucleo in a "typical" PC mode as a control

  - Default configuration with all peripherals disabled, only CPU clocks enabled. Enter a deadloop for a few seconds

- I should configure the Nucleo in a lowest possible while-still-functional PC mode where lowest power is achieved with no built in low power modes used (turn off all clocks as possible, CPU clocks remain on)

- ○ All peripherals disabled. Further research needed for what else can be disabled while the CPU is still active. If program is too similar to the "typical" test, this one will be removed

- I shall configure the Nucleo in `Sleep-now` and `Stop` modes (AN2629)

  - ○ One test for `Sleep-now` and `Stop` mode respectively. Verify mode is entered via power measurements near expected values when entering sleep mode, and when interrupt fires, waking the CPU

- I shall measure power consumption in the mW range for all above mentioned modes

  - ○ Power measurements should align in direction as expected shown in Table 1. Measurements then posted to a chart, with data including min, max and avg for each test

- I shall compare and assess the various above mentioned modes qualitatively for their difficulty in implementation and effectiveness

  - ○ Create a chart of subjective difficulty in implementation of various methods.

- I should calculate minimum theoretical power consumption for all above mentioned modes

  - ○ Using datasheets?

- I should configure the Nucleo in `Standby` mode (AN2629)

  - ○ Possibly too difficult, or may not respond to interrupts as required. Further research needed

- I should investigate other algorithms for low PC that do not use built in low power modes

  - ○ More research is needed

- I should determine the incremental power consumption of all `stm32f103rb` peripherals by subtracting the power with the peripherals on and the power with all peripherals on.
  - For all peripherals, first measure "typical power" with all peripherals off, then for each turn it on measure power. Then subtract to obtain the incremental power used by the peripheral.
- I should use an existing project or code and determine its current power consumption, and attempt to use methods to minimize its power consumption, then measure the power.
  - TBD

Test Name	Expected Power consumption order (higher = more power)
Max PC	highest
"typical"	4
Lowest while-still-functional	3
Sleep	2 (less power by a factor of 5? Compared to typical?)
Stop	1
Standby	Lowest

Table 1: Estimated power consumption test alignment