

DESN2000 (Computer
Engineering)

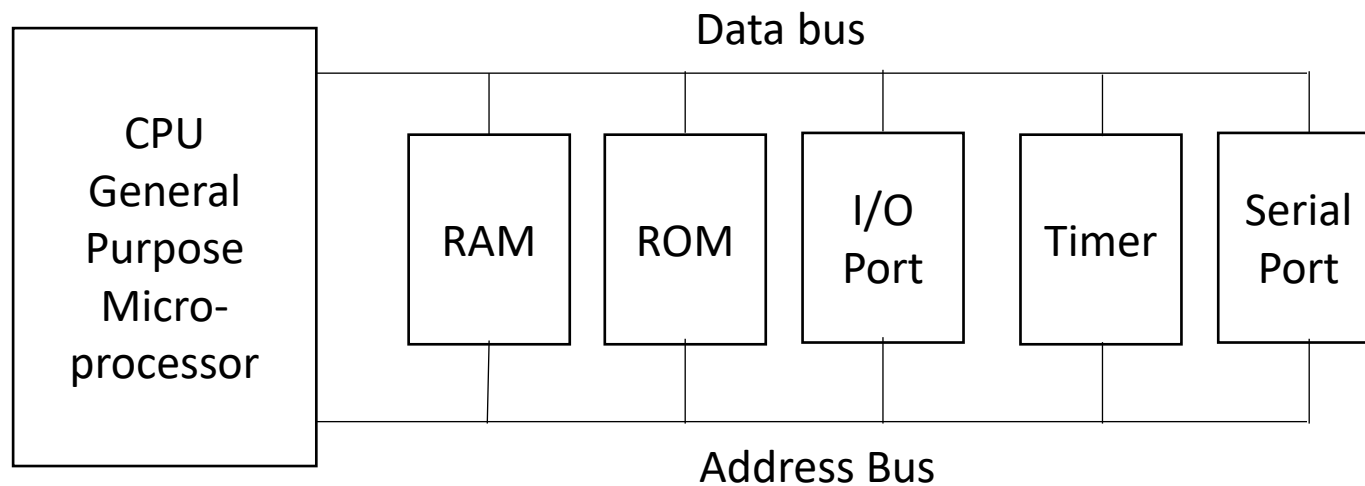
Introduction to STM32
ARM and GPIO

Hasindu Gamaarachchi

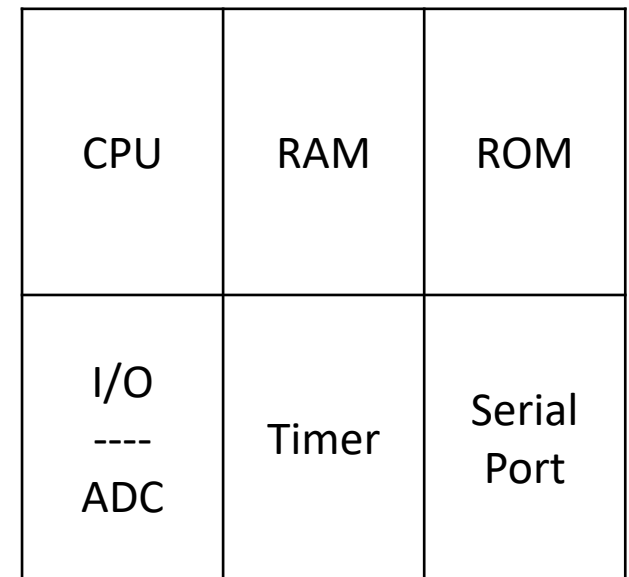
What are embedded systems?

- A system composed of computer processor, computer memory, and input/output peripheral devices
- Embedded as part of a complete device often including electrical or electronic hardware and mechanical parts
- Dedicated function within a larger mechanical or electronic system
- e.g.: calculators, printers, Microwave ovens, treadmills ...

Microprocessors vs Microcontrollers



General Purpose Microprocessor System



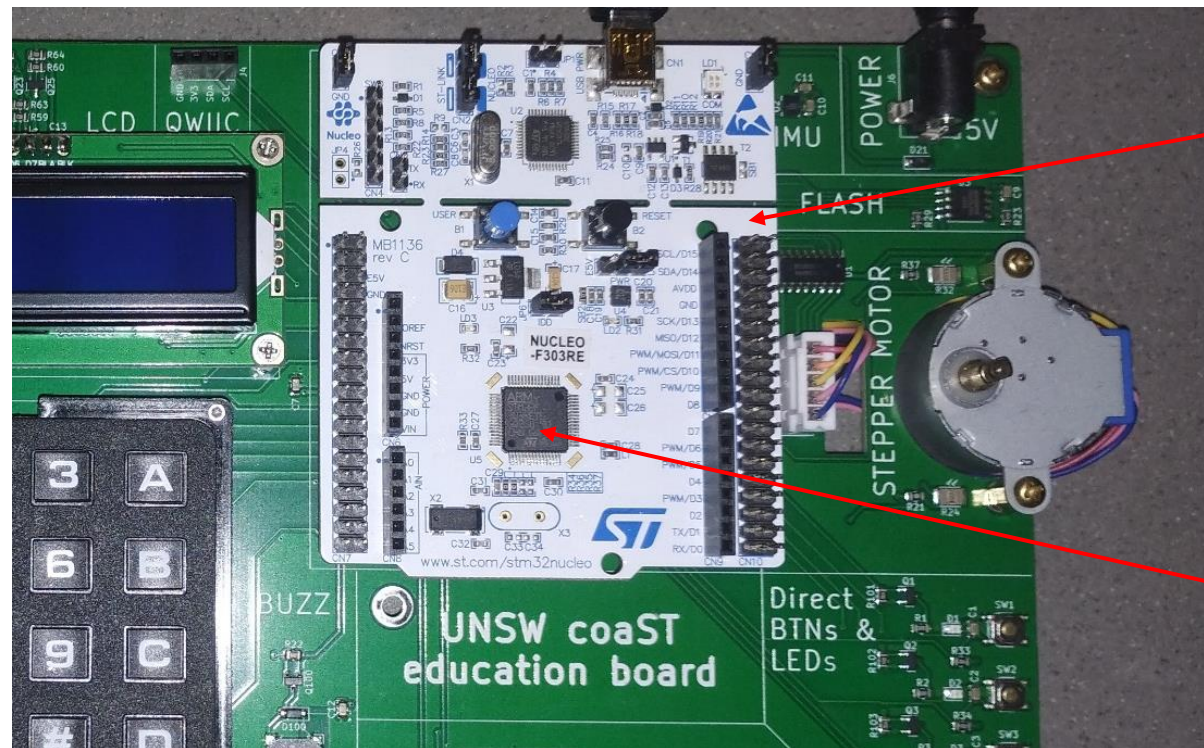
Microcontroller

Different Microcontrollers

- Microchip PIC
- Atmel AVR (Now under Microchip)
- Espressif Systems (ESP8266 and ESP32)
- ARM-based microcontrollers
 - **STMicroelectronics STM32** ← What we learn
 - NXP Freescale
 - Texas Instruments LM4F, TM4C ...
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STM32F303RE

- We will focus on STM32F303RE, which is the microcontroller found in the NUCLEO-F303RE Board

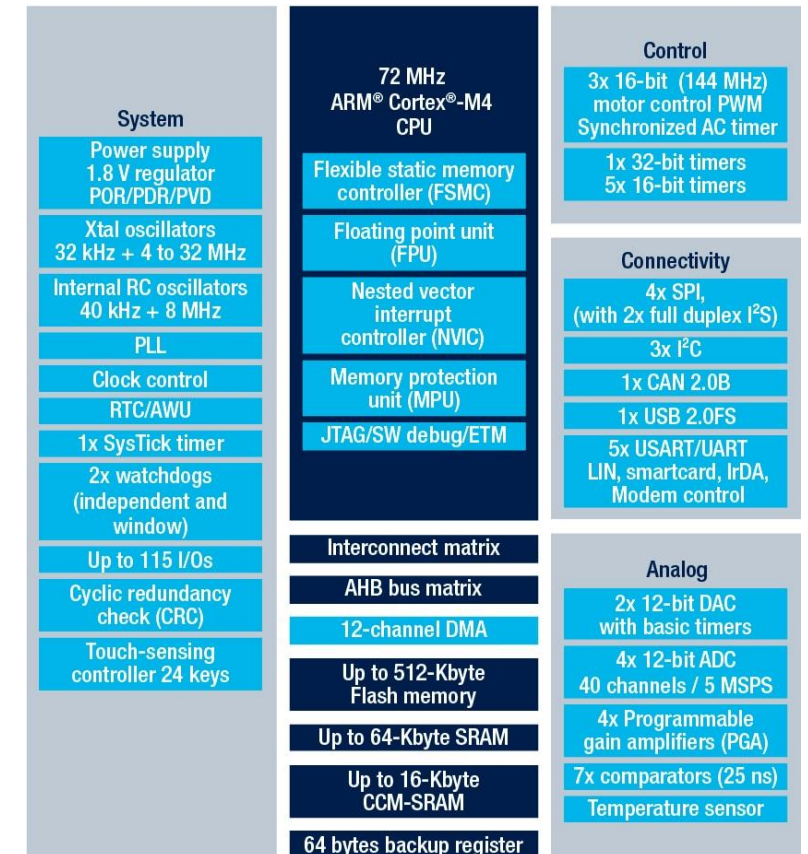


NUCLEO-F303RE Board

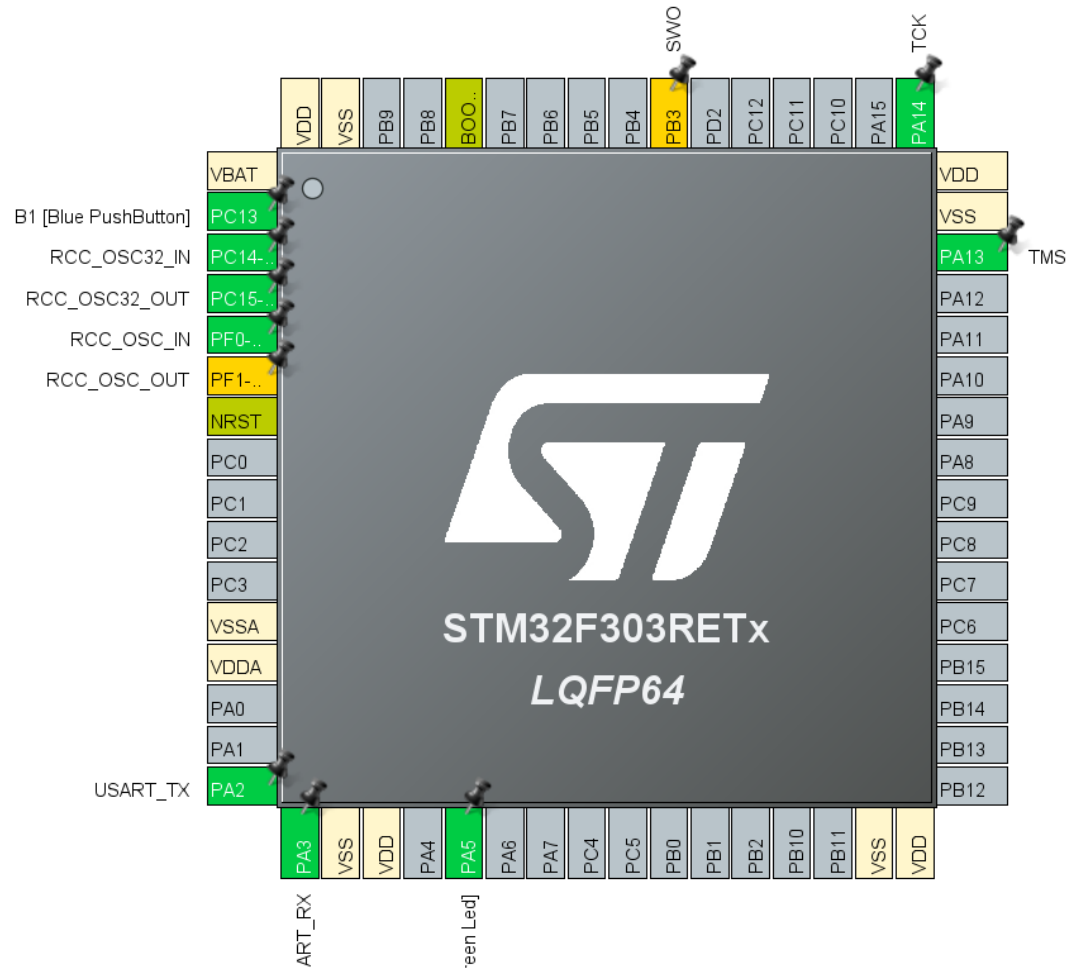
STM32F303RE ARM microcontroller

STM32F303RE Specification

- ARM Cortex-M4 32-bit CPU
- 64 Kbytes of SRAM
- Operating voltage - 2.0 V to 3.6 V
- Peripherals such as
 - Digital I/O
 - Analogue to Digital Converters (ADC)
 - Timers
 - Serial communication interfaces
- More info:
 - <https://www.st.com/en/microcontrollers-microprocessors/stm32f303re.html>
- Datasheet:
 - <https://www.st.com/resource/en/datasheet/stm32f303re.pdf>



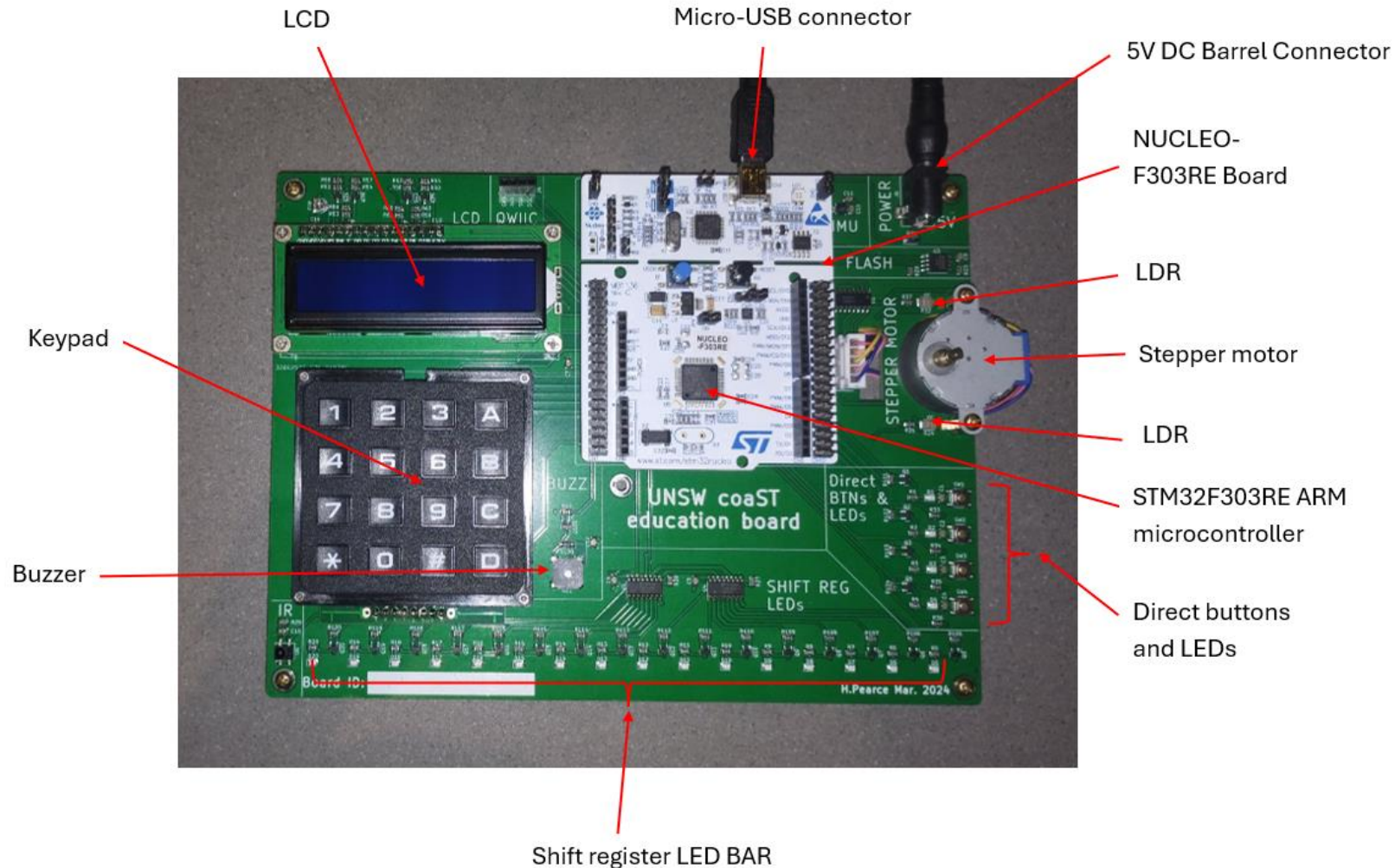
STM32F303RE LQFP64 Pins



General Purpose I/O Pins

- Limited pins on a microcontroller
- GPIO pins can be configured by software to do different functions like
 - Digital I/O
 - Analogue I/O
 - Communication, interrupts, timer capture etc.

coaST board components



Board components:

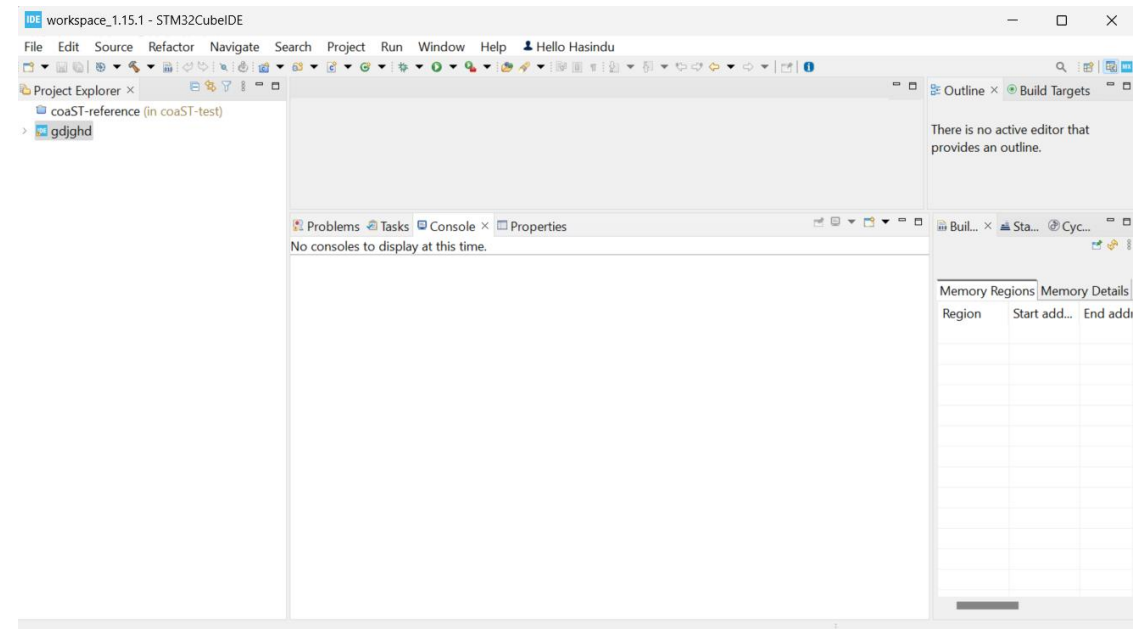
<https://webcms3.cse.unsw.edu.au/DESN2000/24T2/resources/99720>

Board pin connection:

<https://webcms3.cse.unsw.edu.au/DESN2000/24T2/resources/100378>

STM32 cubeIDE

- STM's integrated development environment (IDE)
 - Code Editor
 - Compiler
 - Drivers
 - Debugger
 - Flasher/programmer
- Getting started with cubeIDE
 - <https://webcms3.cse.unsw.edu.au/DESN2000/24T2/resources/99719>



End of Slides

Let us move on to the whiteboard and
some live coding

- Getting started with STM cubeIDE
- Digital I/O
 - Output: direct LEDs
 - Input: direct buttons

Reading Material

- Zhu, Yifeng, Embedded systems with ARM Cortex-M microcontrollers in assembly language and C
 - Chapter on GPIO (Chapter 15 in 4th edition)