Introduction to IoT
LAB Exercises

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IoT LAB - Outline

- Shift register
- PWM

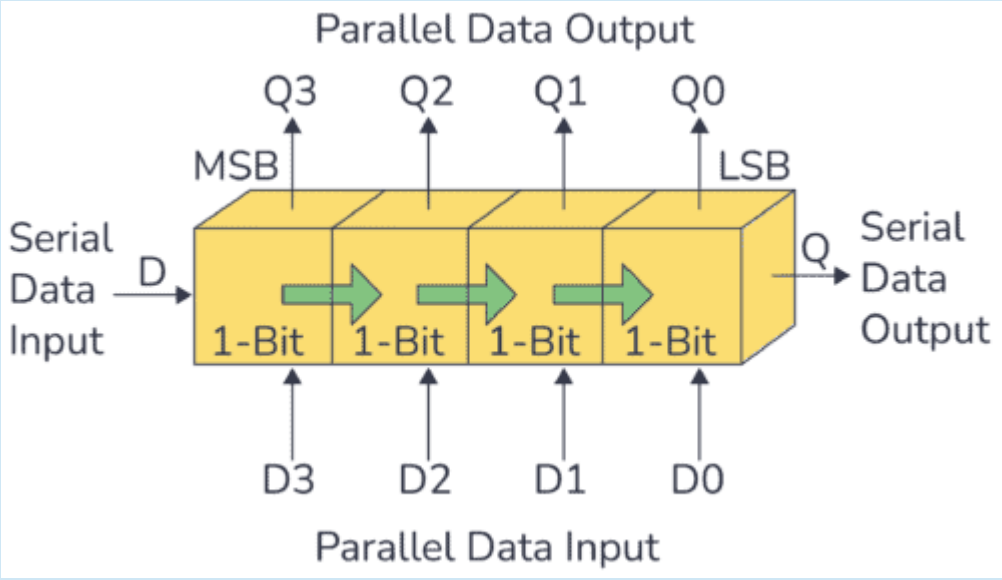
Hardware Overview

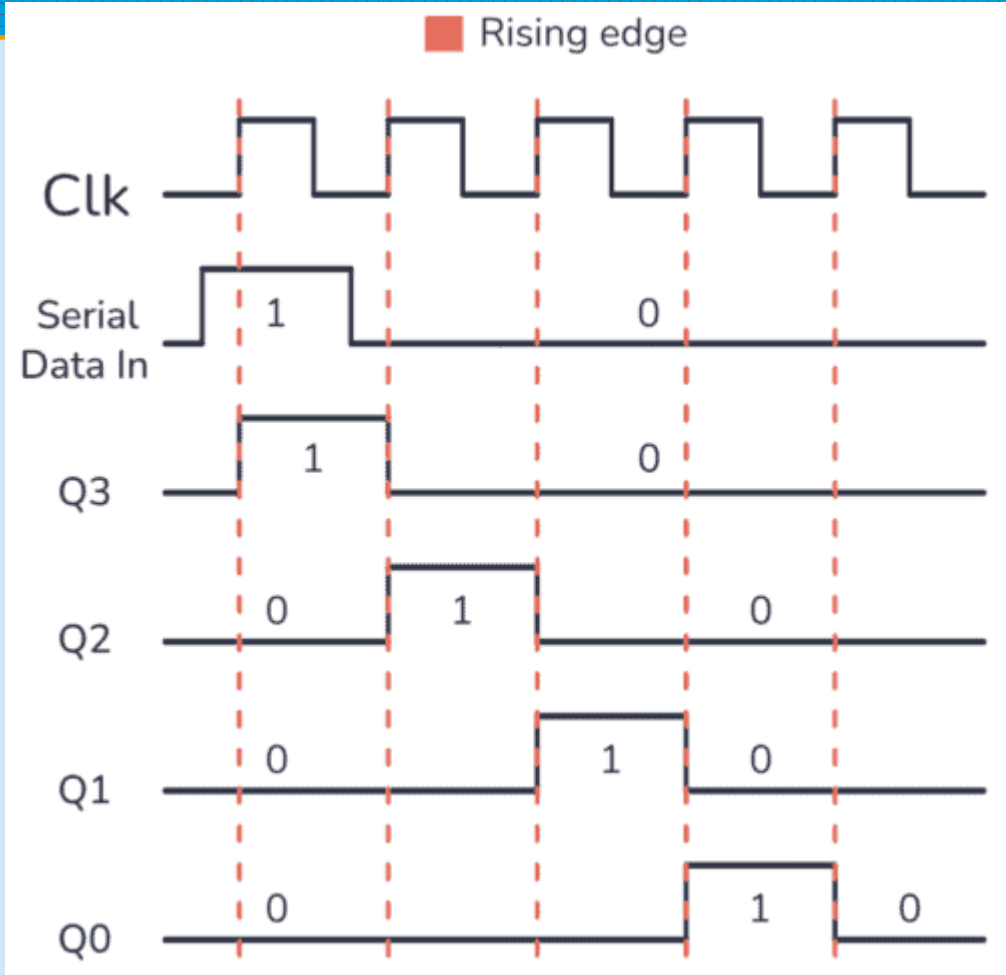
- MCU board - STM32
- Communication board – CANBus
- Application board – PushButton + ShiftRegister
- Application board – Oled

STM32 pinout

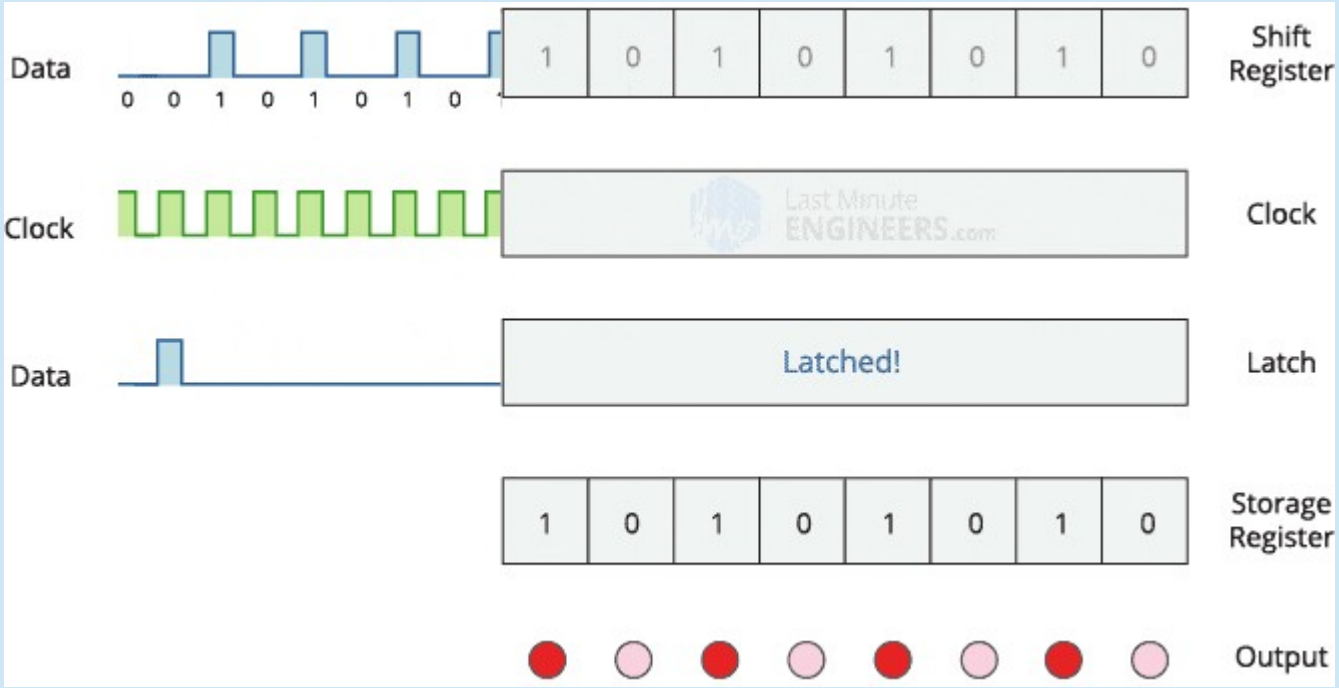
STM32 BluePill

IoT LAB	BluePill	IoT LAB	BluePill
UART TX	PA2 (UART2)	**SPI CS**	PA4 (SPI 1)
UART RX	PA3 (UART2)	**SPI SCK**	PA5 (SPI 1)
I2C SCL	PB6 (I2C 1)	**SPI MISO**	PA6 (SPI 1)
I2C SDA	PB7 (I2C 1)	**SPI MOSI**	PA7 (SPI 1)
GP-1	PB5	**GP-5**	PB15
GP-2	PA15	**GP-6**	PB13
GP-3	PB4	**GP-7**	PB14
GP-4	PB3	**GP-8**	PB12


Parallel Data Output
Q3
Q2
Q1
Q0
MSB
LSB
Serial
Data
Input
D
1-Bit
1-Bit
1-Bit
1-Bit
Q
Serial
Data
Output
D3
D2
D1
D0
Parallel Data Input


Rising edge
Clk
Serial Data In
1
0
Q3
1
0
Q2
0
1
0
Q1
0
1
0
Q0
0
1
0

Shift register



```
int latchPin = PB13;      // GPIO6-PB13
int clockPin = PB15;      // GPIO5-PB15
int dataPin = PB14;       // GPIO7-PB14
byte leds = 0;         // Variable to hold the pattern of which LEDs are currently turned on or off
void setup(){
pinMode(latchPin, OUTPUT);
pinMode(clockPin, OUTPUT);
pinMode(dataPin, OUTPUT);}
void loop()
{
  leds = 0;        // Initially turns all the LEDs off, by giving the variable 'leds' the value 0
  delay(50);
  for (int i = 0; i < 8; i++)        // Turn all the LEDs ON one by one.
  {
    bitSet(leds, i);                // Set the bit that controls that LED in the variable 'leds'
   digitalWrite(latchPin, LOW);
    for(int i = 7; i >=  0; i--){
  digitalWrite(clockPin, LOW); int val = leds & (1 « i);
  digitalWrite(dataPin, val);
  digitalWrite(clockPin, HIGH);};
    digitalWrite(latchPin, HIGH);
     delay(500);
  }
}
```

```
int latchPin = PB13;      // GPIO6-PB13
int clockPin = PB15;      // GPIO5-PB15
int dataPin = PB14;       // GPIO7-PB14
byte leds = 0;         // Variable to hold the pattern of which LEDs are currently turned on or off

void loop()
{
  leds = 0;        // Initially turns all the LEDs off, by giving the variable 'leds' the value 0
  updateShiftRegister();
  delay(500);
  for (int i = 0; i < 8; i++)        // Turn all the LEDs ON one by one.
  {
    bitSet(leds, i);                // Set the bit that controls that LED in the variable 'leds'
   digitalWrite(latchPin, LOW);
    shiftOut(dataPin, clockPin, LSBFIRST, leds);
    digitalWrite(latchPin, HIGH);
    delay(500);
  }
}
```

Now it is the time for your own experiments!