7a laboratory work

UART Read

1. Aim

- Learn how to use UART read functions.
- Learn, how to write a code for packet parsing.

2. Theory

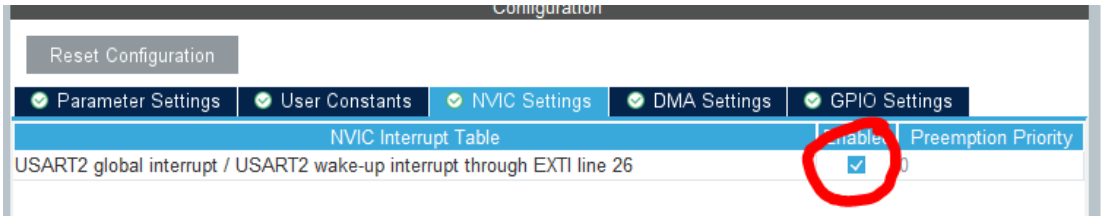
To read bytes from UART, there are several methods.

First method is called as pulling. If you use this method – means you are always waiting on some data received from UART and cannot do something else.

```
/* USER CODE BEGIN PD */
#define UART_BUFFER_SIZE 2
/* USER CODE END PD */

/* USER CODE BEGIN PM */
uint8_t dateBuffer[UART_BUFFER_SIZE];
/* USER CODE END PM */

/* USER CODE BEGIN WHILE */
while (1)
  {
   HAL_UART_Receive(&huart2, dateBuffer, UART_BUFFER_SIZE, 1000);
   if ( dateBuffer[0] == 'R')
            {
            if (dateBuffer[1] == '1')
            {
               HAL_GPIO_WritePin(LED_GREEN_GPIO_Port, LED_GREEN_Pin, RESET);

            }
            if (dateBuffer[1] == '0')
            {
              HAL_GPIO_WritePin(LED_GREEN_GPIO_Port, LED_GREEN_Pin, SET);
            }
            dateBuffer[0] = 0;
            dateBuffer[1] = 0;
            }
   HAL_Delay(100);

  }
/* USER CODE END WHILE */
```

More efficient method is to use interrupts.

First you need to enable interrupt generation from UART.



After generate the code you need to initiate RX interrupt in main.c

```
/* USER CODE BEGIN 2 */
  HAL_UART_Receive_IT(&huart2, (uint8_t *)dateBuffer, UART_BUFFER_SIZE);
  /* USER CODE END 2 */
```

Interrupt function wich give you notification, that UART did receive `UART_BUFFER_SIZE bytesis called void HAL_UART_RxCpltCallback(UART_HandleTypeDef *huart).`

```
/* USER CODE BEGIN 4 */
void HAL_UART_RxCpltCallback(UART_HandleTypeDef *huart)
  {
        if (huart->Instance == USART2)
        {
            packetIsReady = 1;
            HAL_UART_Receive_IT(&huart2, (uint8_t *)dateBuffer, UART_BUFFER_SIZE);
        }
  }
/* USER CODE END 4 */
```

In this function you are actually checking which UART did generate interrupt, setting `packetIsReady` flag for packet parser in main loop and running interrupt again.

Parser in main loop is working only if flag `packetIsReady` become 1 (True).

```
/* USER CODE BEGIN WHILE */
  while (1)
  {
     if (packetIsReady)
     {
        if ( dateBuffer[0] == 'R')
            {
              if (dateBuffer[1] == '1')
             {
              HAL_GPIO_WritePin(LED_GREEN_GPIO_Port, LED_GREEN_Pin, RESET);
              }
              if (dateBuffer[1] == '0')
              {
               HAL_GPIO_WritePin(LED_GREEN_GPIO_Port, LED_GREEN_Pin, SET);
               }
                dateBuffer[0] = 0;
                dateBuffer[1] = 0;
                }
            packetIsReady = 0;
             }
    /* USER CODE END WHILE */
```

3. Tasks

a. Write code for read ASCII numbers from UART from “1” to “9” and blink an LED so many times.

b. User 3 color LED’s. Write a code to read commands - sequence of bytes: „R11“, „G21“, „B31“ and blinks dedicated LED’s. If you will get „R10“, „G20“, „B30“ – the dedicated LED needs to stop blinking. Please use two interrupts for UART and the Time of the blinking period. For the parser, please use a **switch case**.

4. Report content

1) Title.
2) Main blocks of source code for tasks with comments.
3) Conclusions.

5. References

1. https://deepbluembedded.com/how-to-receive-uart-serial-data-with-stm32-dma-interrupt-polling/
2. http://www.emcu.eu/how-to-manage-two-uart-usart2-and-usart1-under-interrupt/
3. https://www.programmersought.com/article/4525115054/