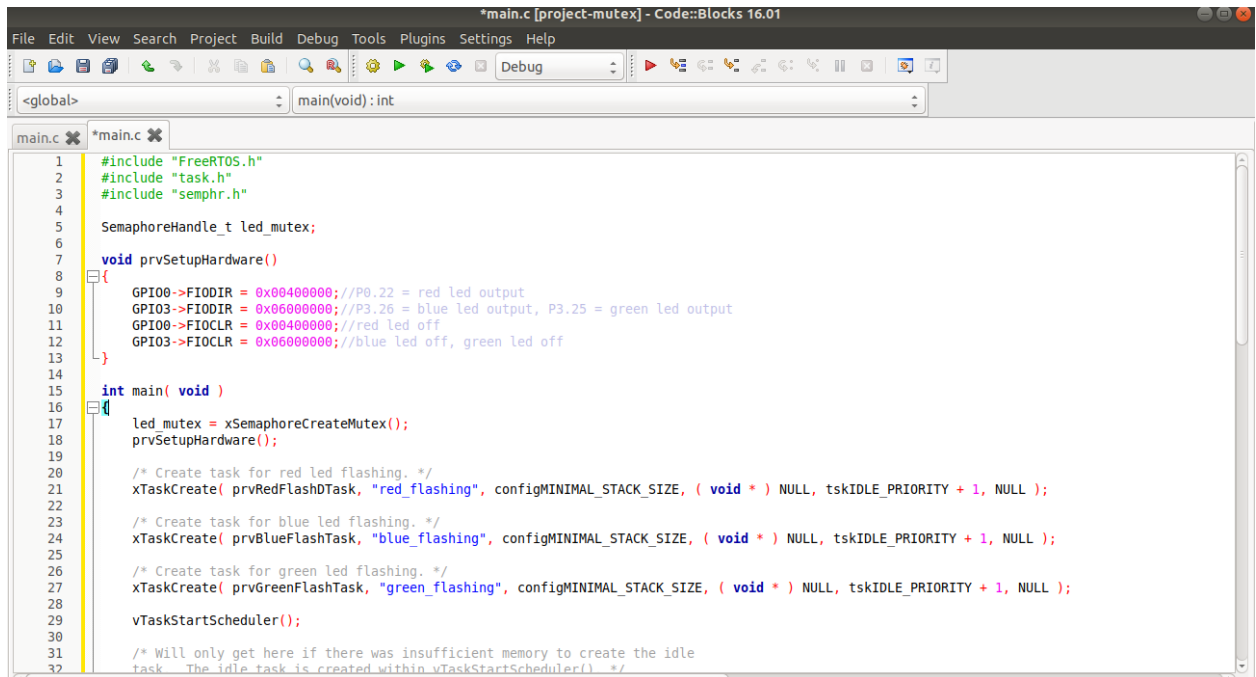


**ESE-3025**  
**Homework 5**

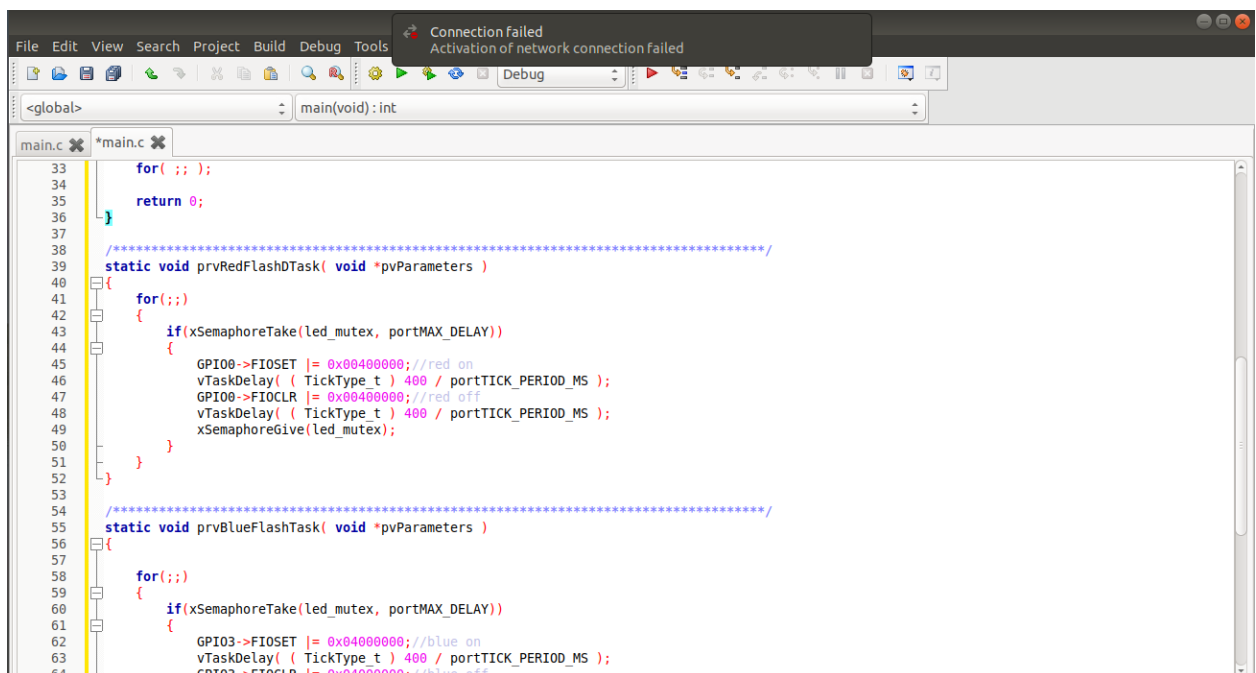
**Submitted By:**  
**Shweta(747925)**

1. Consider the problem of flashing the LEDs as you have done in the FreeRTOS Blinky Project, with the timings for on/off described there, as well as the fact that the LED colours (Red, Green and Blue) must not mix using the FreeRTOS mutex API.

Solution-



```
*main.c [project-mutex] - Code::Blocks 16.01
File Edit View Search Project Build Debug Tools Plugins Settings Help
<global> main(void):int
main.c *main.c
1 #include "FreeRTOS.h"
2 #include "task.h"
3 #include "semphr.h"
4
5 SemaphoreHandle_t led_mutex;
6
7 void prvSetupHardware()
8 {
9     GPIO0->FIODIR = 0x00400000; //P0.22 = red led output
10    GPIO3->FIODIR = 0x06000000; //P3.26 = blue led output, P3.25 = green led output
11    GPIO0->FIOCLR = 0x00400000; //red led off
12    GPIO3->FIOCLR = 0x06000000; //blue led off, green led off
13 }
14
15 int main( void )
16 {
17     led_mutex = xSemaphoreCreateMutex();
18     prvSetupHardware();
19
20     /* Create task for red led flashing. */
21     xTaskCreate( prvRedFlashTask, "red_flashing", configMINIMAL_STACK_SIZE, ( void * ) NULL, tskIDLE_PRIORITY + 1, NULL );
22
23     /* Create task for blue led flashing. */
24     xTaskCreate( prvBlueFlashTask, "blue_flashing", configMINIMAL_STACK_SIZE, ( void * ) NULL, tskIDLE_PRIORITY + 1, NULL );
25
26     /* Create task for green led flashing. */
27     xTaskCreate( prvGreenFlashTask, "green_flashing", configMINIMAL_STACK_SIZE, ( void * ) NULL, tskIDLE_PRIORITY + 1, NULL );
28
29     vTaskStartScheduler();
30
31     /* Will only get here if there was insufficient memory to create the idle
32     task. The idle task is created within vTaskStartScheduler(). */
```



```
Connection failed
Activation of network connection failed
File Edit View Search Project Build Debug Tools
<global> main(void):int
main.c *main.c
33 for(;;);
34
35 return 0;
36 }
37
38 /******
39 static void prvRedFlashTask( void *pvParameters )
40 {
41     for(;;)
42     {
43         if(xSemaphoreTake(led_mutex, portMAX_DELAY))
44         {
45             GPIO0->FIOSET |= 0x00400000; //red on
46             vTaskDelay( ( TickType_t ) 400 / portTICK_PERIOD_MS );
47             GPIO0->FIOCLR |= 0x00400000; //red off
48             vTaskDelay( ( TickType_t ) 400 / portTICK_PERIOD_MS );
49             xSemaphoreGive(led_mutex);
50         }
51     }
52 }
53
54 /******
55 static void prvBlueFlashTask( void *pvParameters )
56 {
57     for(;;)
58     {
59         if(xSemaphoreTake(led_mutex, portMAX_DELAY))
60         {
61             GPIO3->FIOSET |= 0x04000000; //blue on
62             vTaskDelay( ( TickType_t ) 400 / portTICK_PERIOD_MS );
63             GPIO3->FIOCLR |= 0x04000000; //blue off
64             xSemaphoreGive(led_mutex);
65         }
66     }
67 }
```

```

*main.c [project-mutex] - Code::Blocks 16.01
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<global> main(void):int
main.c *main.c
55 static void prvBlueFlashTask( void *pvParameters )
56 {
57     for(;;)
58     {
59         if(xSemaphoreTake(led_mutex, portMAX_DELAY))
60         {
61             GPIO3->FIOSET |= 0x04000000; //blue on
62             vTaskDelay( ( TickType_t ) 400 / portTICK_PERIOD_MS );
63             GPIO3->FIOCLR |= 0x04000000; //blue off
64             vTaskDelay( ( TickType_t ) 400 / portTICK_PERIOD_MS );
65             xSemaphoreGive(led_mutex);
66         }
67     }
68 }
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*main.c [project-mutex] - Code::Blocks 16.01
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<global> prvGreenFlashTask(void* pvParameters): void

main.c *main.c
33
34
35 /*****
36 static void prvRedFlashTask( void *pvParameters )
37 {
38     for(;;)
39     {
40         taskENTER_CRITICAL();
41         GPIO0->FIOSET |= 0x00400000; //red on
42         vTaskDelay( ( TickType_t ) 400 / portTICK_PERIOD_MS );
43         GPIO0->FIOCLR |= 0x00400000; //red off
44         vTaskDelay( ( TickType_t ) 400 / portTICK_PERIOD_MS );
45         taskEXIT_CRITICAL();
46     }
47 }
48
49 /*****
50 static void prvBlueFlashTask( void *pvParameters )
51 {
52     for(;;)
53     {
54         taskENTER_CRITICAL();
55         GPIO3->FIOSET |= 0x04000000; //blue on
56         vTaskDelay( ( TickType_t ) 400 / portTICK_PERIOD_MS );
57         GPIO3->FIOCLR |= 0x04000000; //blue off
58         vTaskDelay( ( TickType_t ) 400 / portTICK_PERIOD_MS );
59         taskEXIT_CRITICAL();
60     }
61 }
62
63 /*****
64 static void prvGreenFlashTask( void *pvParameters )
```

```
*main.c [project-mutex] - Code::Blocks 16.01
File Edit View Search Project Build Debug Tools Plugins Settings Help
<global> prvGreenFlashTask(void* pvParameters): void

main.c *main.c
45 }
46 }
47
48 /*****
49 static void prvBlueFlashTask( void *pvParameters )
50 {
51     for(;;)
52     {
53         taskENTER_CRITICAL();
54         GPIO3->FIOSET |= 0x04000000; //blue on
55         vTaskDelay( ( TickType_t ) 400 / portTICK_PERIOD_MS );
56         GPIO3->FIOCLR |= 0x04000000; //blue off
57         vTaskDelay( ( TickType_t ) 400 / portTICK_PERIOD_MS );
58         taskEXIT_CRITICAL();
59     }
60 }
61
62 /*****
63 static void prvGreenFlashTask( void *pvParameters )
64 {
65     for(;;)
66     {
67         taskENTER_CRITICAL();
68         GGPI03->FIOSET |= 0x02000000; //green on
69         vTaskDelay( ( TickType_t ) 400 / portTICK_PERIOD_MS );
70         GPIO3->FIOCLR |= 0x02000000; //green off
71         vTaskDelay( ( TickType_t ) 400 / portTICK_PERIOD_MS );
72         taskEXIT_CRITICAL();
73     }
74 }
75 }
```

3. Write a short evaluation of used versions of code stating it's advantages and disadvantages?

**Solution- Using Mutex**

**Advantages-**

Tasks and resources/data can be synchronized by the use of mutex and it also doesn't impact interrupts.

**Disadvantages-**

Mutex can only be unlocked from the same process which locked it thus if the locking process is in blocked state or is sleeping, then other tasks which require the same mutex will remain in blocked state thus freezing the system into deadlock.

**Using taskENTER\_CRITICAL() & taskEXIT\_CRITICAL()**

**Advantages-**

No initialization has to be done so it is simple and easy to use.

**Disadvantages-**

It messes with scheduler because it has to disable interrupts and thus preemption and freeRTOS working is affected. The system becomes less responsive due to disabled interrupts.

Link to the output:

<https://youtu.be/7WYSJC1aBoI>

