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ECE-40290
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Date: 11/9/2021

# Assignment 5: Queues

The following will document completion of the fifth assignment for ECE-40290, with the stated goals of:

- **Create "Queue1" that is length of five to hold up to five uint32_t values.**
- **Create "Task 1" that will run every 2 seconds, increment a count, then send the count to the queue. Use a value of portMAX_DELAY when writing to the queue.**
- **Create "Task 2" that will receive from the queue, then display the count received from the queue. Use a value of portMAX_DELAY when reading from the queue.**
- **Run this on the STM32CubeIDE (with IoT Discovery Board or equivalent) and observe the result.**

## 1. Create "Queue1" that is length of five to hold up to five uint32_t values

To start, we'll generate a default project as before. Under the FreeRTOS configuration window, select the *Task and Queues* tab. Create Queue1 of size 5 * uint32_t as described.

Queues

| Queue Name | Queue Size | Item Size | A |
|---|---|---|---|
| Queue1 | 5 | uint32_t | Dynamic |

## 2. Create "Task 1" that will run every 2 seconds, increment a count, then send the count to the queue. Use a value of portMAX_DELAY when writing to the queue.

Next create Task1 as in previous assignments.

Config parameters | Include parameters | Advanced settings | User Constants | Tasks and Queues

Tasks

| Task Name | Priority | Stack Size (Words) | Entry Function | Code Generation Op |
|---|---|---|---|---|
| Task1 | osPriorityNormal | 128 | StartTask1 | Default |
| Task2 | osPriorityBelowNormal | 128 | StartTask2 | Default |

Within main.c, we can define *StartTask1()* as seen below, where a counter value is declared and initialized to zero in the setup area. Within the for(;;) section, the value is sent to the queue created previously, an error me sage will be printed if necessary, then the counter is incremented before the task delays for two seconds.

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```
492  /* USER CODE BEGIN Header_StartTask1 */
493  /**
494    * @brief  Function implementing the Task1 thread.
495    * @param  argument: Not used
496    * @retval None
497    */
498  /* USER CODE END Header_StartTask1 */
499  void StartTask1(void const * argument)
500  {
501    /* USER CODE BEGIN 5 */
502
503            uint32_t counterValue = 0;
504
505            // Result status of queue send to test for success
506            BaseType_t sendResults;
507
508    /* Infinite loop */
509    for(;;)
510    {
511            sendResults = xQueueSend(Queue1Handle, &counterValue, portMAX_DELAY );
512
513            // Test results for success
514            if (sendResults != pdPASS)
515            {
516                    char* errorMsg = "Failed to send value to queue!!!\n";
517                    HAL_UART_Transmit(&huart1, (uint8_t*) errorMsg, strlen(errorMsg), 1000);
518            }
519
520            // Increment counter
521            counterValue++;
522
523            // Two second delay
524            osDelay(2000);
525    }
526    /* USER CODE END 5 */
527  }
528
```

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3. **Create "Task 2" that will receive from the queue, then display the count received from the queue. Use a value of portMAX_DELAY when reading from the queue.**

Repeat creation process for Task2. *StartTask2()* will be configured to receive the counter value out of the queue and print it on the UART1 console, or an error message if necessary.

```
529  /* USER CODE BEGIN Header_StartTask2 */
530  /**
531  * @brief Function implementing the Task2 thread.
532  * @param argument: Not used
533  * @retval None
534  */
535  /* USER CODE END Header_StartTask2 */
536  void StartTask2(void const * argument)
537  {
538    /* USER CODE BEGIN StartTask2 */
539            uint32_t receivedValue = 0;
540
541        // Result status of queue receive to test for success
542            BaseType_t receiveResults;
543
544    /* Infinite loop */
545    for(;;)
546    {
547            // Test if queue is empty or not
548            if (uxQueueMessagesWaiting(Queue1Handle) != 0)
549            {
550                    // Receive the value in the queue
551                    receiveResults = xQueueReceive(Queue1Handle, &receivedValue, portMAX_DELAY );
552
553                    // Test results for success
554                    if (receiveResults != pdPASS)
555                    {
556                            char* errorMsg = "Failed to receive value from queue!!!\n";
557                            HAL_UART_Transmit(&huart1, (uint8_t*) errorMsg, strlen(errorMsg), 1000);
558                    }
559                    else
560                    {
561                            char buffer[100];
562                            snprintf(buffer, sizeof(buffer), "Counter value from queue is: %lu\n", receivedValue);
563                        HAL_UART_Transmit(&huart1, (uint8_t*) buffer, strlen(buffer), 1000);
564                    }
565            }
566        osDelay(1);
567    }
568    /* USER CODE END StartTask2 */
569  }
570
```

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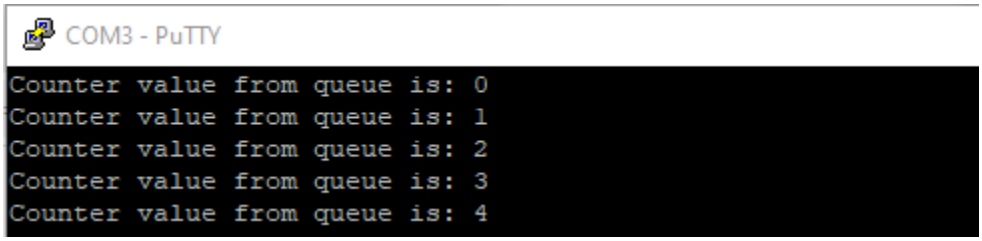
4. **Run this on the STM32CubeIDE (with IoT Discovery Board or equivalent) and observe the result.**

With the program loaded to the dev board, the console can be opened and the counter value will be seen printing.




**Closing Thoughts**

AS I've noted in other assignments, this example took what could be a frustrating idea to implement, and wraps it up in a nice and easy to use abstraction. I'll be interested to see how this concept is applied in creating the ping-pong feature in the final.