CEC Continuing Education Center

DesignNews

Bare Metal C Programming for STM32 Devices

Day 2:

Bare Metal NUCLEO-F207ZG :

Mongoose Network Library Integration Using VS Code

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Webinar Logistics

- Turn on your system sound to hear the streaming presentation.
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- Participate in ‘Attendee Chat’ by maximizing the chat widget in your dock.

Fred Eady

Visit ‘Lecturer Profile’ in your console for more details.

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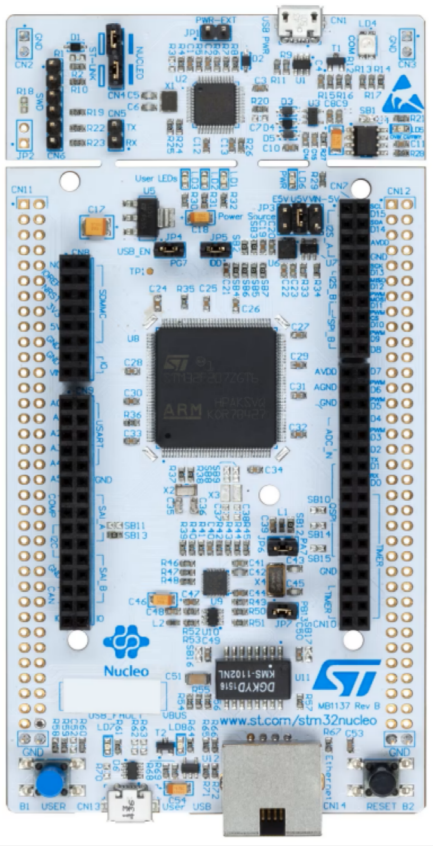
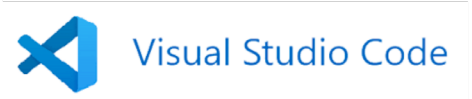
AGENDA

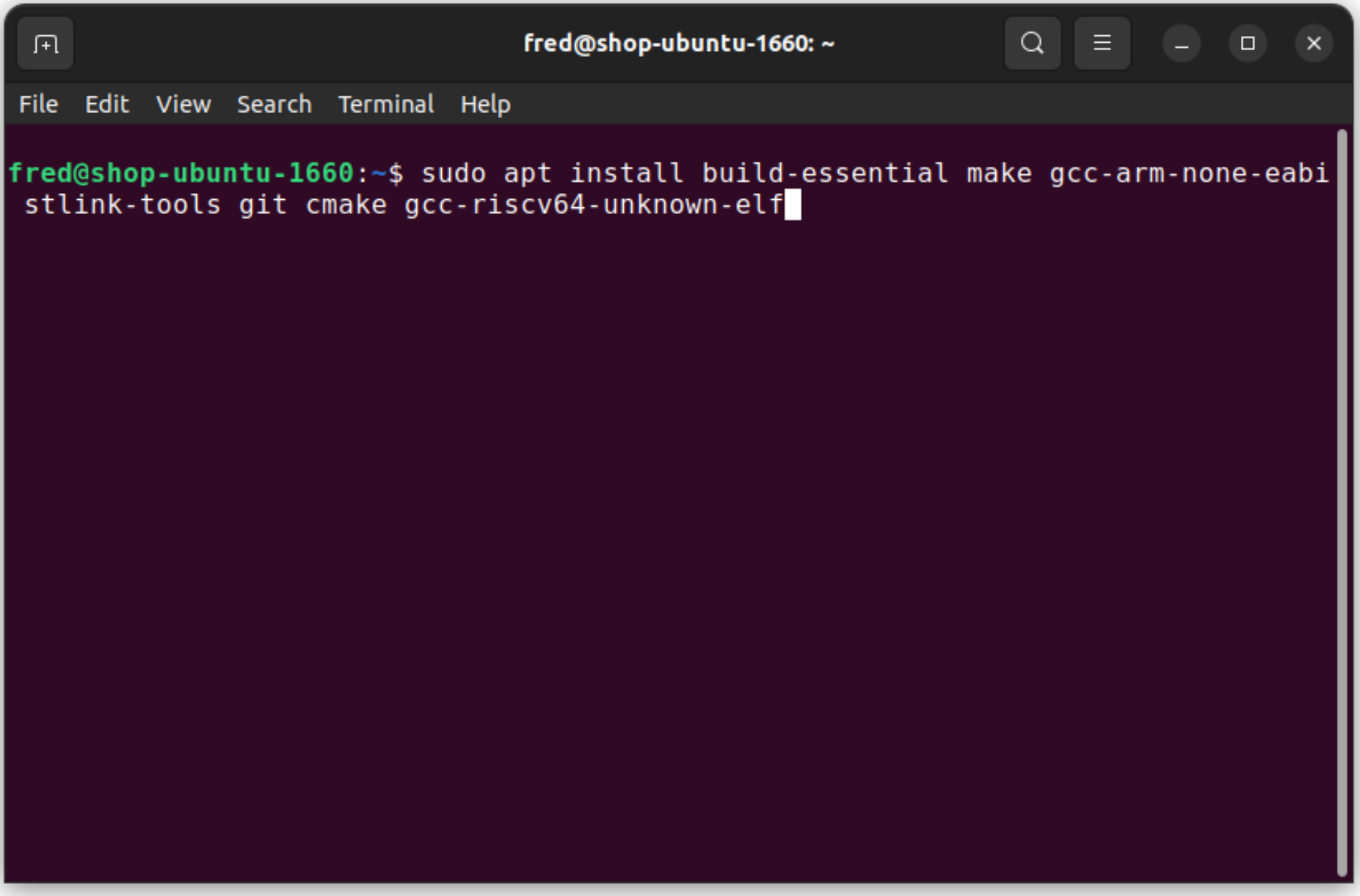
DigiKey

- Mongoose Skeleton Firmware for the NUCLEO-F207ZG
- Integrate Mongoose Manually
- Integrate Mongoose Using the STM32 Mongoose Package

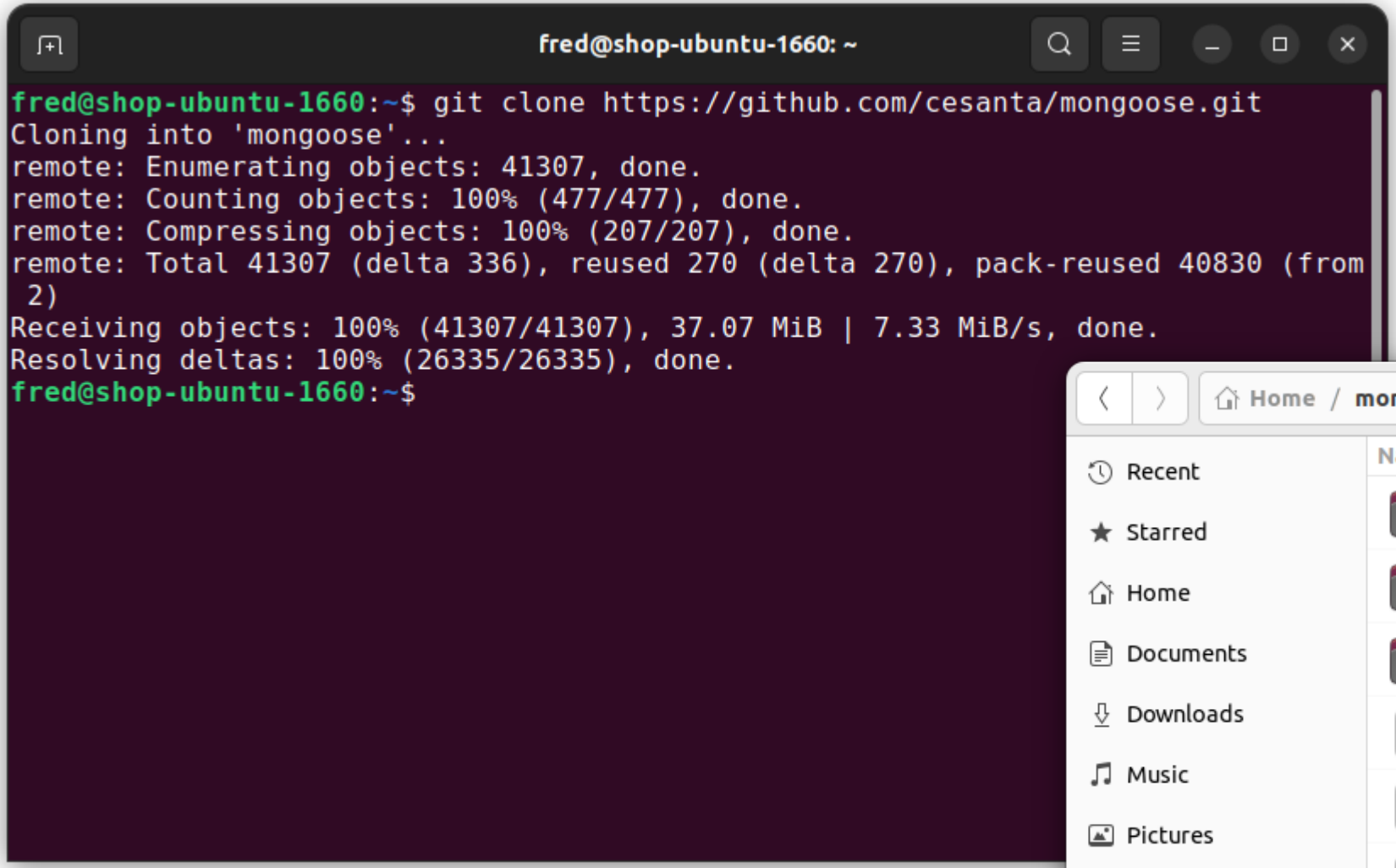


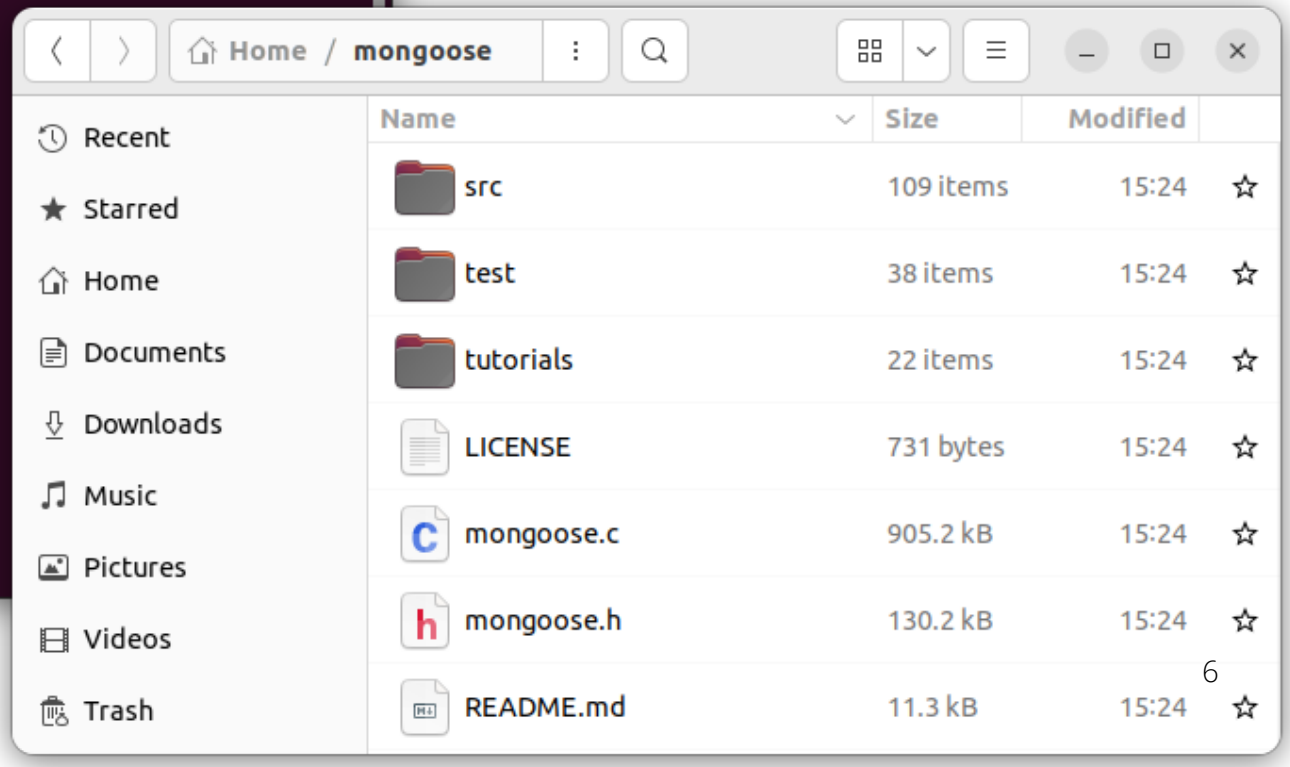


Install the Mongoose Build Tools

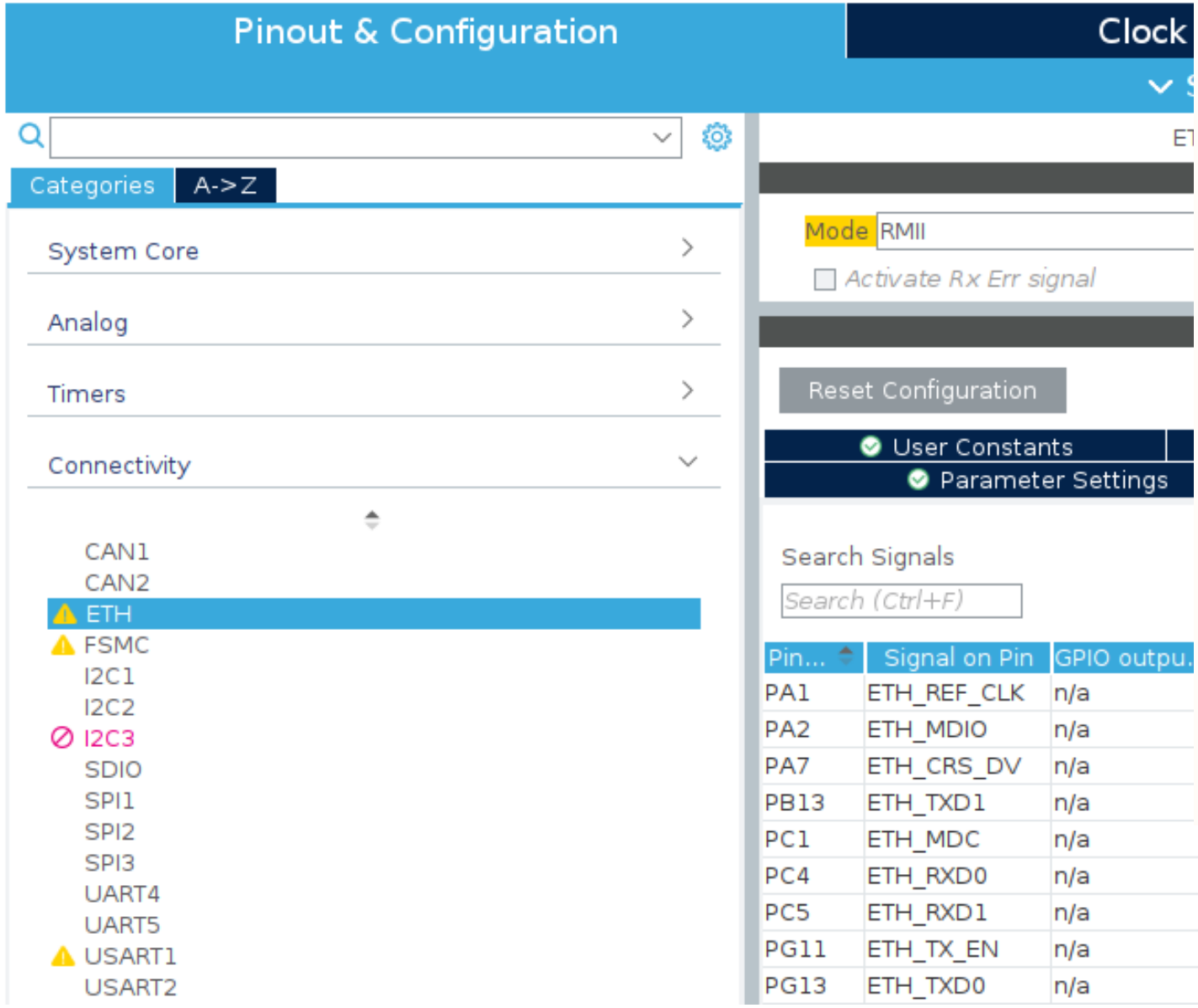


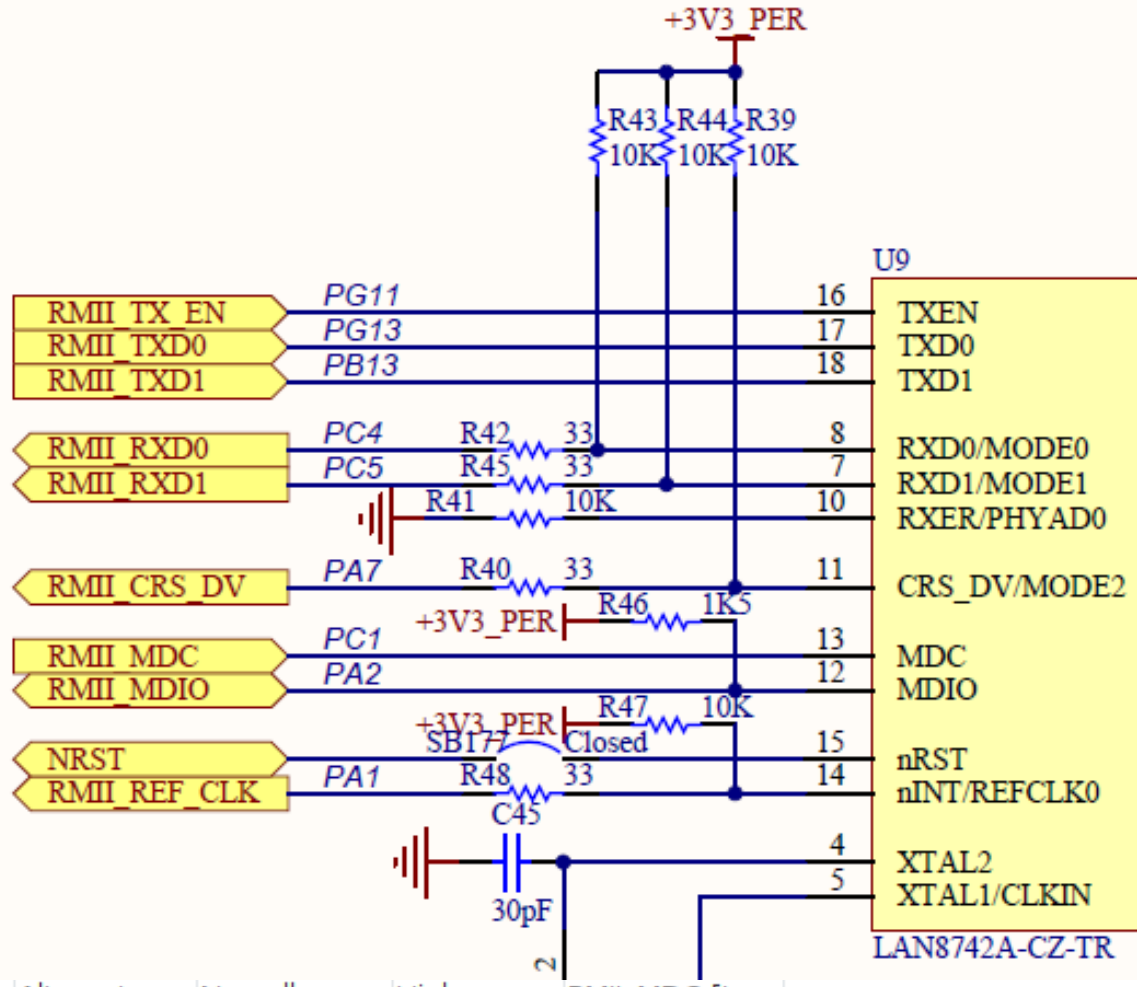
Clone the Cesanta/Mongoose Repository





Verify LAN8742A Connections





Verify USART3 Pin Assignments

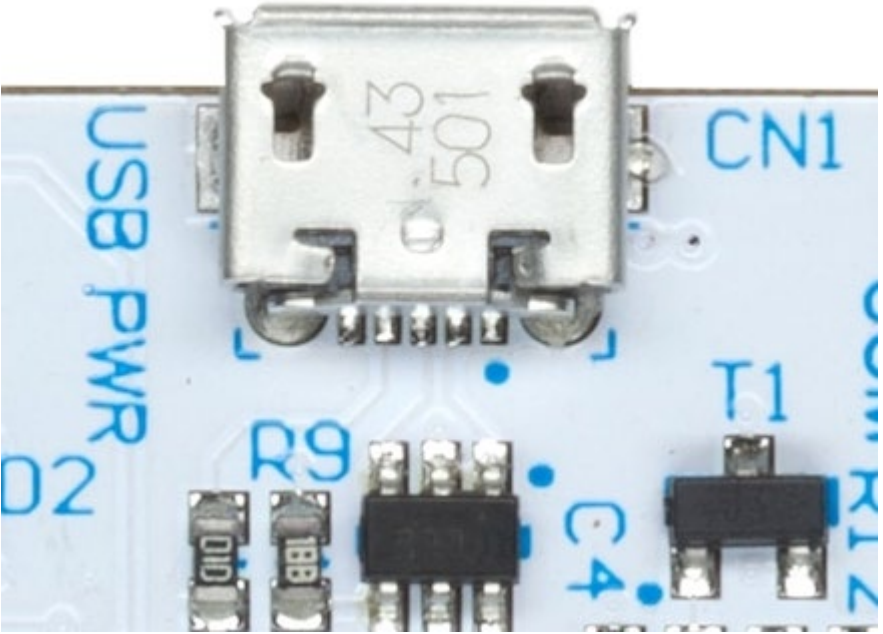
Pinout & Configuration | Clock Configuration

Software Packs | Pinout

Categories | A->Z

System Core

DMA
GPIO
IWDG



GPIO Mode and Configuration

Mode

Configuration

Group By Peripherals

SYS | USART | USB | NVIC
GPIO | Single Mapped Signals | ETH | RCC

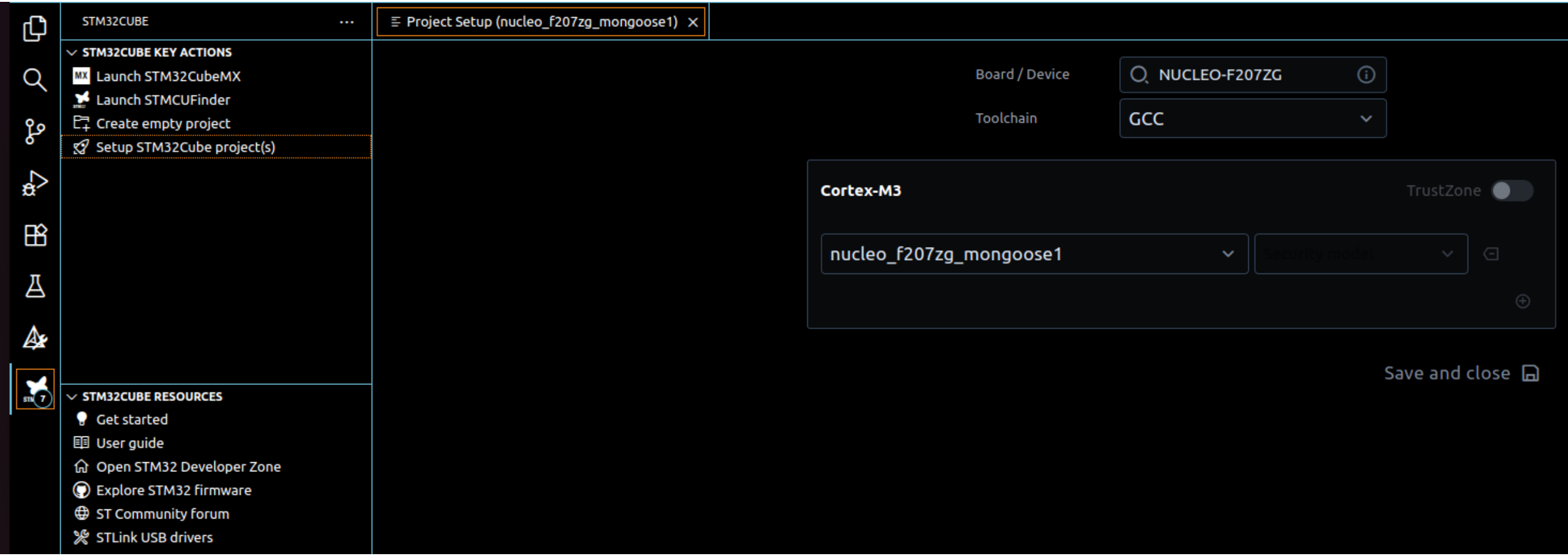
Search Signals

Show only Modified Pins

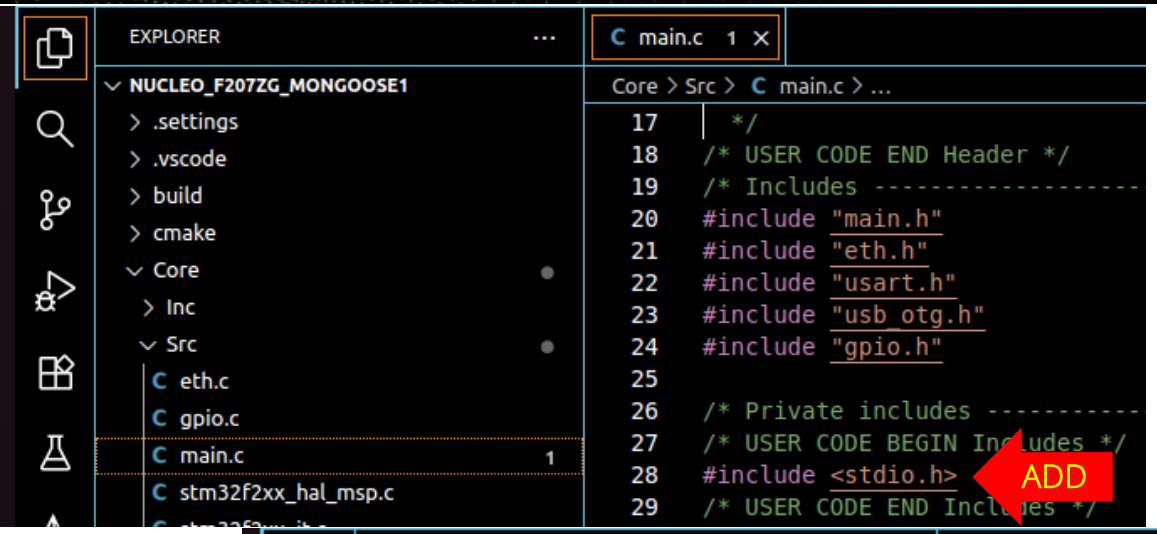
Pin Na...	Signal on ...	GPIO outp...	GPIO mode	GPIO Pull-...	Maximum...	User Label	Modified
PD8	USART3_TX	n/a	Alternate ...	No pull-u...	High	STLK_RX [...	☑
PD9	USART3_RX	n/a	Alternate ...	No pull-u...	High	STLK_TX [...	☑

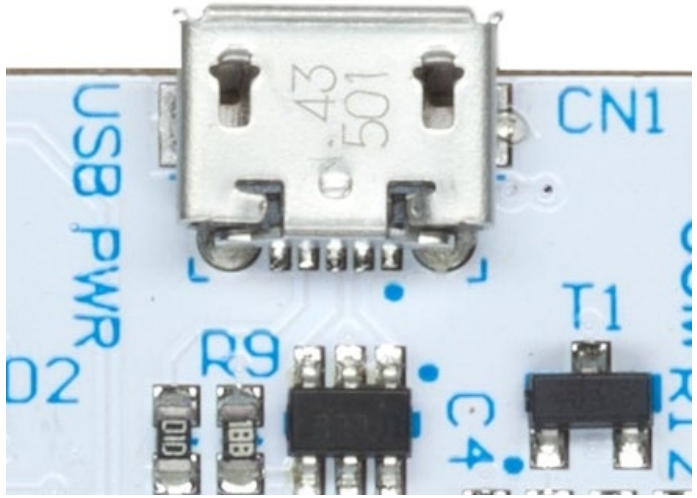
Generate the Code and Import the Project into VS Code

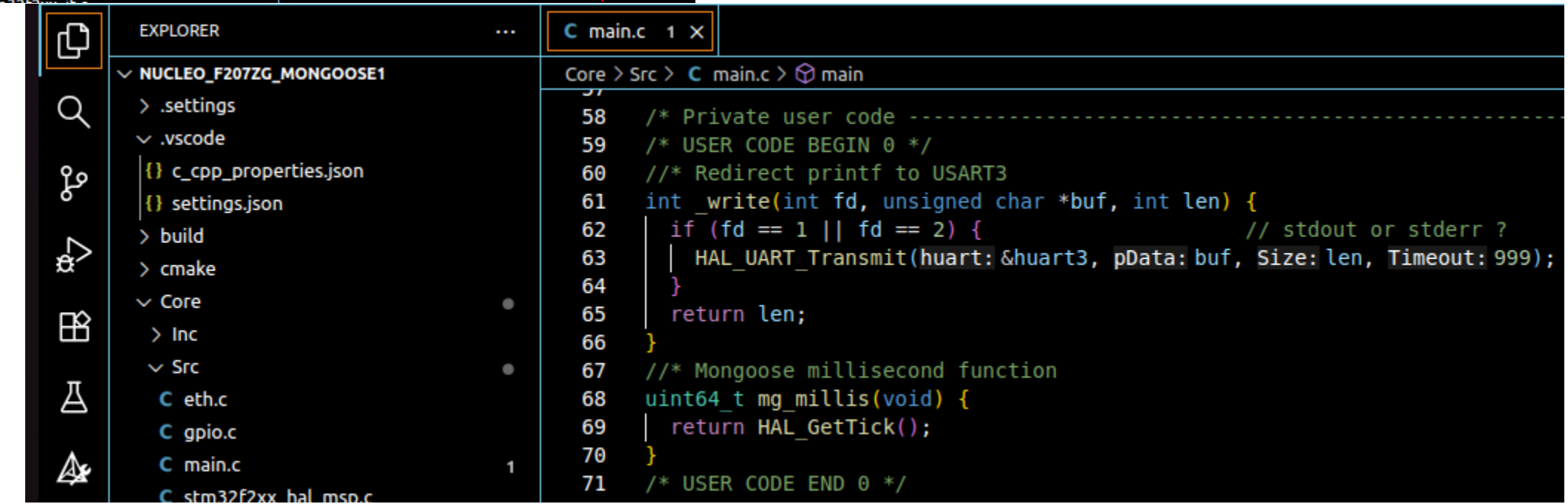
GENERATE CODE



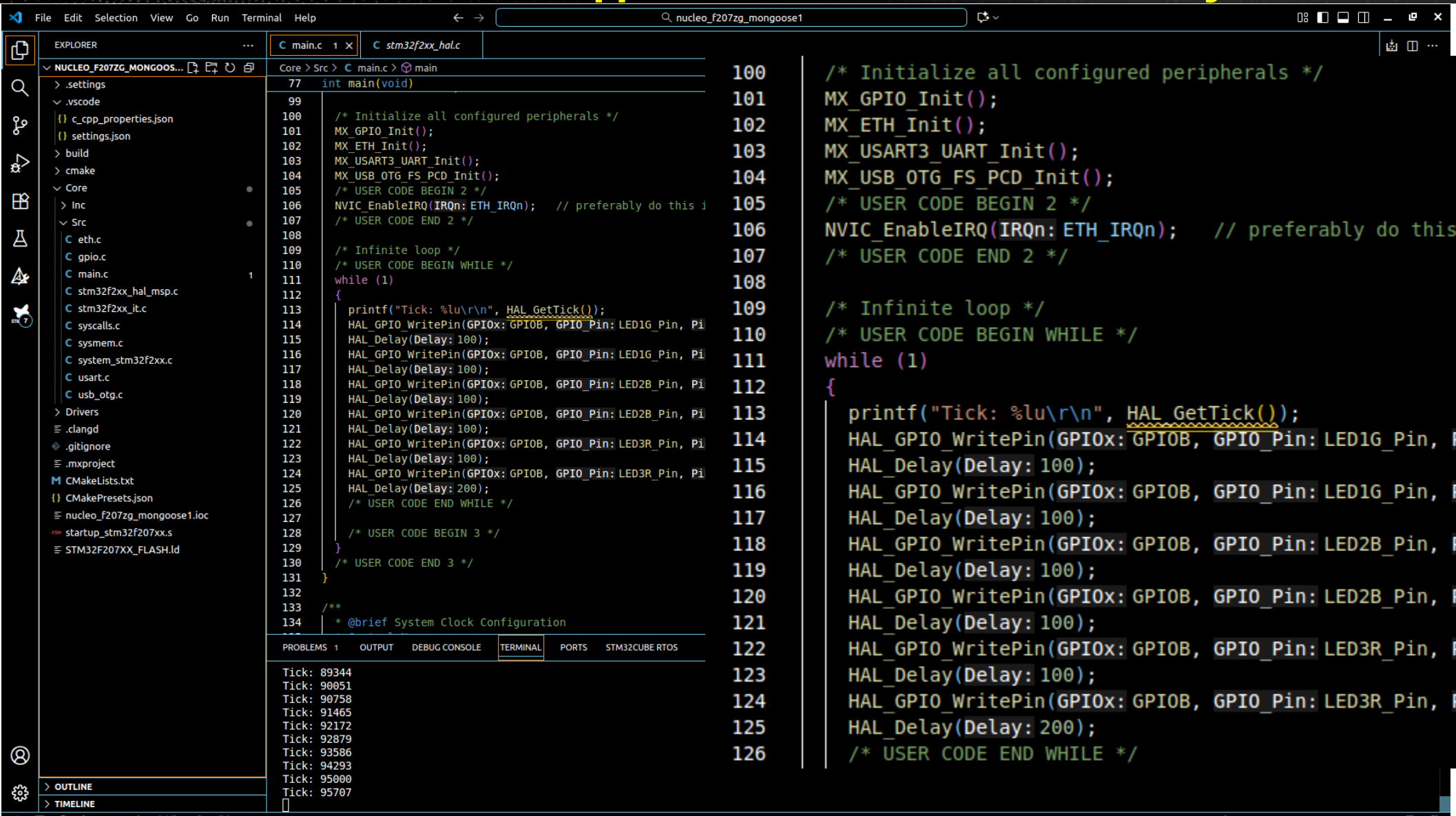
Redirect printf to USART3







Add Application Code and Build the Project



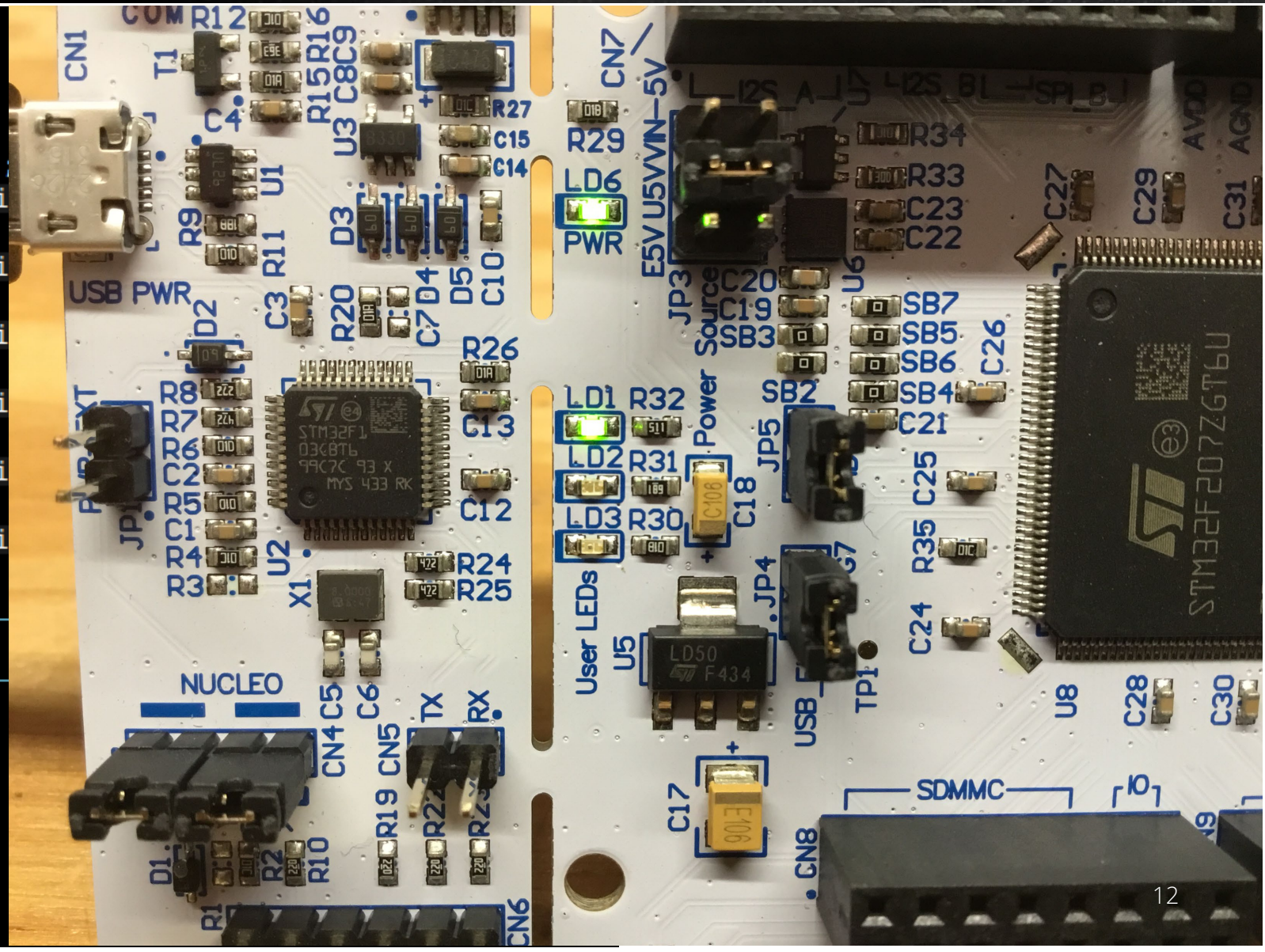

```
100  /* Initialize all configured peripherals */
101  MX_GPIO_Init();
102  MX_ETH_Init();
103  MX_USART3_UART_Init();
104  MX_USB_OTG_FS_PCD_Init();
105  /* USER CODE BEGIN 2 */
106  NVIC_EnableIRQ(IRQn: ETH_IRQn);   // preferably do this in Cube
107  /* USER CODE END 2 */
108
109  /* Infinite loop */
110  /* USER CODE BEGIN WHILE */
111  while (1)
112  {
113    printf("Tick: %lu\r\n", HAL_GetTick());
114    HAL_GPIO_WritePin(GPIOx: GPIOB, GPIO_Pin: LED1G_Pin, PinState: GPIO_PIN_SET);
115    HAL_Delay(Delay: 100);
116    HAL_GPIO_WritePin(GPIOx: GPIOB, GPIO_Pin: LED1G_Pin, PinState: GPIO_PIN_RESET);
117    HAL_Delay(Delay: 100);
118    HAL_GPIO_WritePin(GPIOx: GPIOB, GPIO_Pin: LED2B_Pin, PinState: GPIO_PIN_SET);
119    HAL_Delay(Delay: 100);
120    HAL_GPIO_WritePin(GPIOx: GPIOB, GPIO_Pin: LED2B_Pin, PinState: GPIO_PIN_RESET);
121    HAL_Delay(Delay: 100);
122    HAL_GPIO_WritePin(GPIOx: GPIOB, GPIO_Pin: LED3R_Pin, PinState: GPIO_PIN_SET);
123    HAL_Delay(Delay: 100);
124    HAL_GPIO_WritePin(GPIOx: GPIOB, GPIO_Pin: LED3R_Pin, PinState: GPIO_PIN_RESET);
125    HAL_Delay(Delay: 200);
126    /* USER CODE END WHILE */
```

Call In MAX

```
109   /* Infinite loop */
110   /* USER CODE BEGIN WHILE */
111   while (1)
112   {
113     printf("Tick: %lu\r\n", HAL_GetTick());
114     HAL_GPIO_WritePin(GPIOx: GPIOB, GPIO_Pi
115     HAL_Delay(Delay: 100);
116     HAL_GPIO_WritePin(GPIOx: GPIOB, GPIO_Pi
117     HAL_Delay(Delay: 100);
118     HAL_GPIO_WritePin(GPIOx: GPIOB, GPIO_Pi
119     HAL_Delay(Delay: 100);
120     HAL_GPIO_WritePin(GPIOx: GPIOB, GPIO_Pi
121     HAL_Delay(Delay: 100);
122     HAL_GPIO_WritePin(GPIOx: GPIOB, GPIO_Pi
123     HAL_Delay(Delay: 100);
124     HAL_GPIO_WritePin(GPIOx: GPIOB, GPIO_Pi
125     HAL_Delay(Delay: 200);
126     /* USER CODE END WHILE */
```

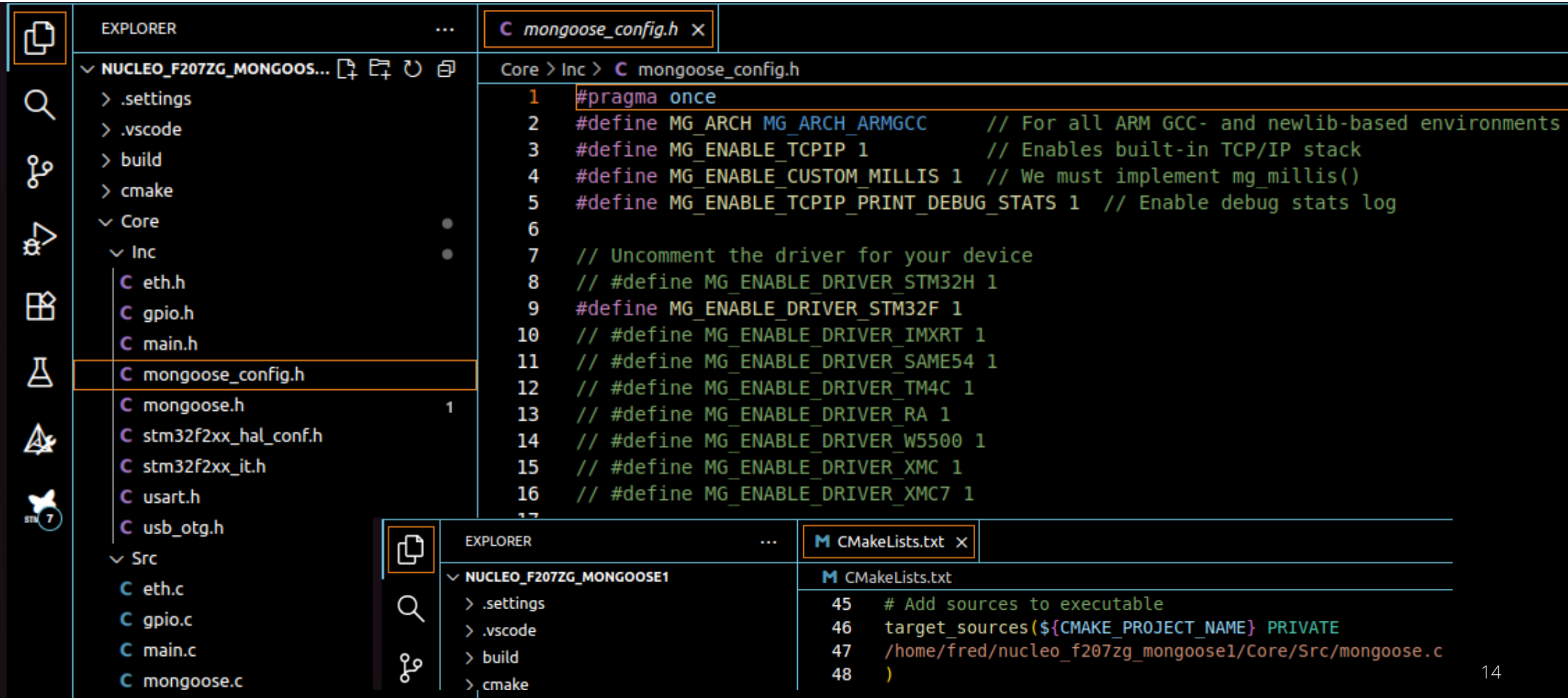
PROBLEMS 1 | OUTPUT | DEBUG CONSOLE | TERMINAL | PORTS

```
Tick: 1688
Tick: 2395
Tick: 3102
Tick: 3809
Tick: 4516
Tick: 5223
Tick: 5930
```



PLEASE INCLUDE BLINKY.MOV HERE

Create mongoose_config.h – Add mongoose.c and mongoose.h to the Skeleton



Include mongoose.h and Add the *run_mongoose* Function to the Skeleton

EXPLORER

C main.c 1

Core > Src > C main.c > main

```
26  /* Private includes ----------
27  /* USER CODE BEGIN Includes */
28  #include <stdio.h>
29  #include "mongoose.h"
30  /* USER CODE END Includes */
```

- C gpio.h
- C main.h
- C mongoose_config.h
- C mongoose.h
- C stm32f2xx_hal_conf.h

C main.c 1

Core > Src > C main.c > main

```
86  int main(void)
109   /* Initialize all configured peripherals */
110   MX_GPIO_Init();
111   MX_ETH_Init();
112   MX_USART3_UART_Init();
113   MX_USB_OTG_FS_PCD_Init();
114   /* USER CODE BEGIN 2 */
115   NVIC_EnableIRQ(IRQn: ETH_IRQn);   // preferably do this in Cube
116   run_mongoose();
117   /* USER CODE END 2 */
```

- C mongoose.c

C main.c 1

Core > Src > C main.c > main

```
59  /* Private user code ----------
60  /* USER CODE BEGIN 0 */
61  static void run_mongoose(void) {
62    struct mg_mgr mgr;          // Mongoose event manager
63    mg_mgr_init(&mgr);          // Initialise event manager
64    mg_log_set(MG_LL_DEBUG);    // Set log level to debug
65    for (;;) {                  // Infinite event loop
66      mg_mgr_poll(&mgr, ms: 0);   // Process network events
67    }
68  }
69  //* Redirect printf to USART3
70  int _write(int fd, unsigned char *buf, int len) {
71    if (fd == 1 || fd == 2) {                    // stdout or stderr ?
72      HAL_UART_Transmit(huart: &huart3, pData: buf, Size: len, Timeout: 999);
73    }
74    return len;
75  }
76  //* Mongoose millisecond function
77  uint64_t mg_millis(void) {
78    return HAL_GetTick();
79  }
80  /* USER CODE END 0 */
81
```

Install the STM32 Mongoose Package

Embedded Software Packages Manager

STM32Cube MCU Packages and embedded software packs releases

Releases Information was last refreshed less than one hour ago.

Infineon | RealThread | SEGGER | WES | emotas | portGmbH | quantropi | wolfSSL
STM32Cube MCU Packages | STMicroelectronics | Avnet-IotConnect | Cesanta | EmbeddedOffice | ITTIA_DB

	Status	Description	Available
▼		I-CUBE-Mongoose	
☑		A premium, all-in-one TCP/IP + TLS stack with embedded web server and	7.19.0
☐		A premium, all-in-one TCP/IP + TLS stack with embedded web server and	7.13.0

Details

Release version : 7.19.0
Release date : 2025-09-04

Release information :
See https://github.com/cesanta/mongoose/releases/tag/7.19

From Local ... | From Url ... | Refresh | Install | Remove | Close

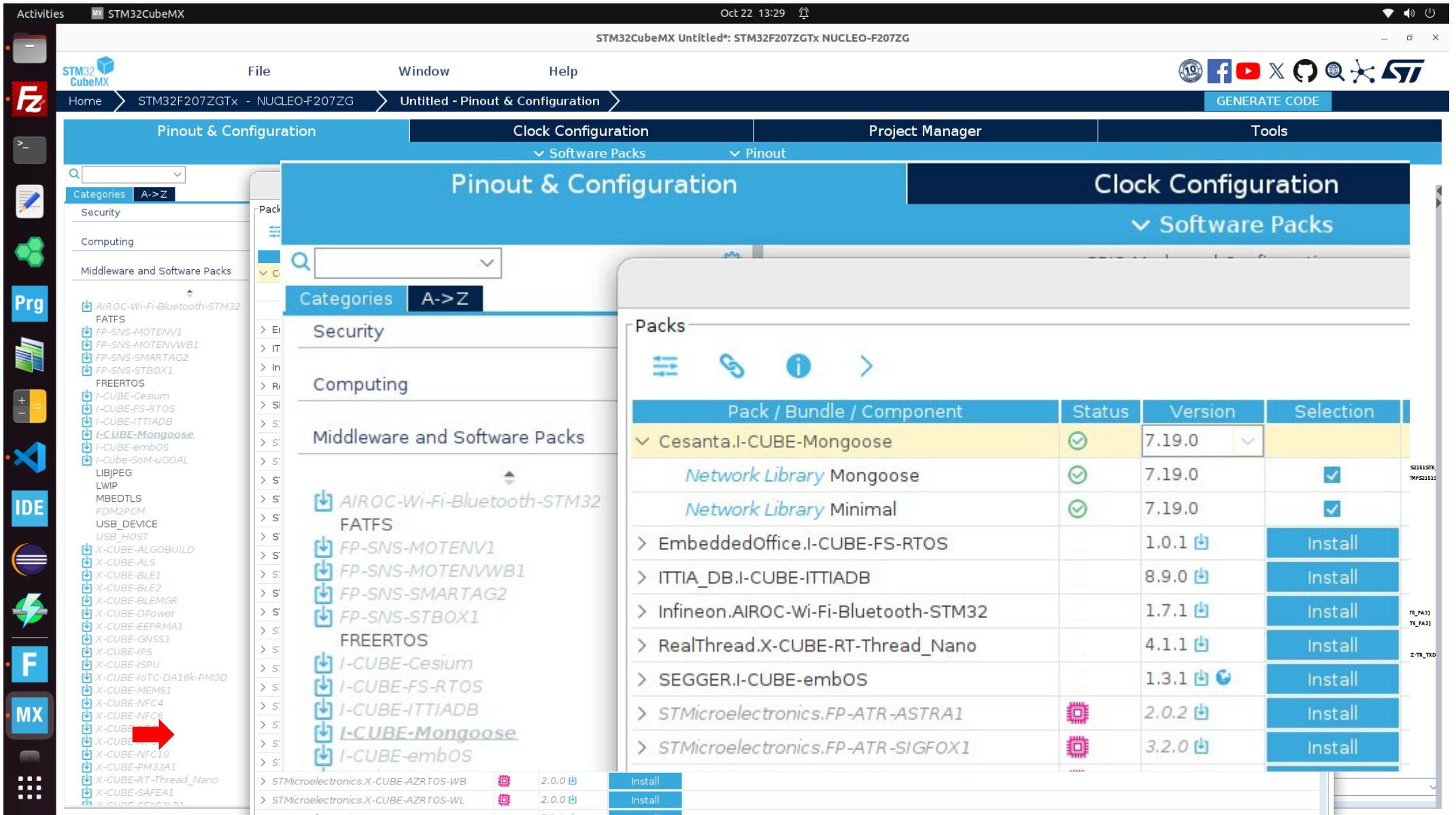
Clock Configuration

Software Packs | Pinout

GPIO Mode and Configuration

Mode

Install the STM32 Mongoose Package



Install the STM32 Mongoose Package

Pinout & Configuration | Clock Configuration

Software Packs | Pinout

Categories | A->Z

Middleware and Software Packs

- AIROC-Wi-Fi-Bluetooth-STM32
- FATFS
- FP-SNS-MOTENV1
- FP-SNS-MOTENVWB1
- FP-SNS-SMARTAG2
- FP-SNS-STAIOTCFT
- FP-SNS-STBOX1
- FREERTOS
- I-CUBE-Cesium
- I-CUBE-FS-RTOS
- I-CUBE-ITTIADB
- I-CUBE-Mongoose
- I-CUBE-embOS
- I-CUBE-wolfSSL
- I-Cube-SoM-uGOAL
- LIBJPEG
- LWIP

Cesanta.I-CUBE-Mongoose.7.19.0 Mode and Configuration

Mode

- [x] Network Library Mongoose
- [x] Network Library Minimal

Configuration

Reset Configuration

Parameter Settings | User Constants

Configure the below parameters :

Search (Ctrl+F)

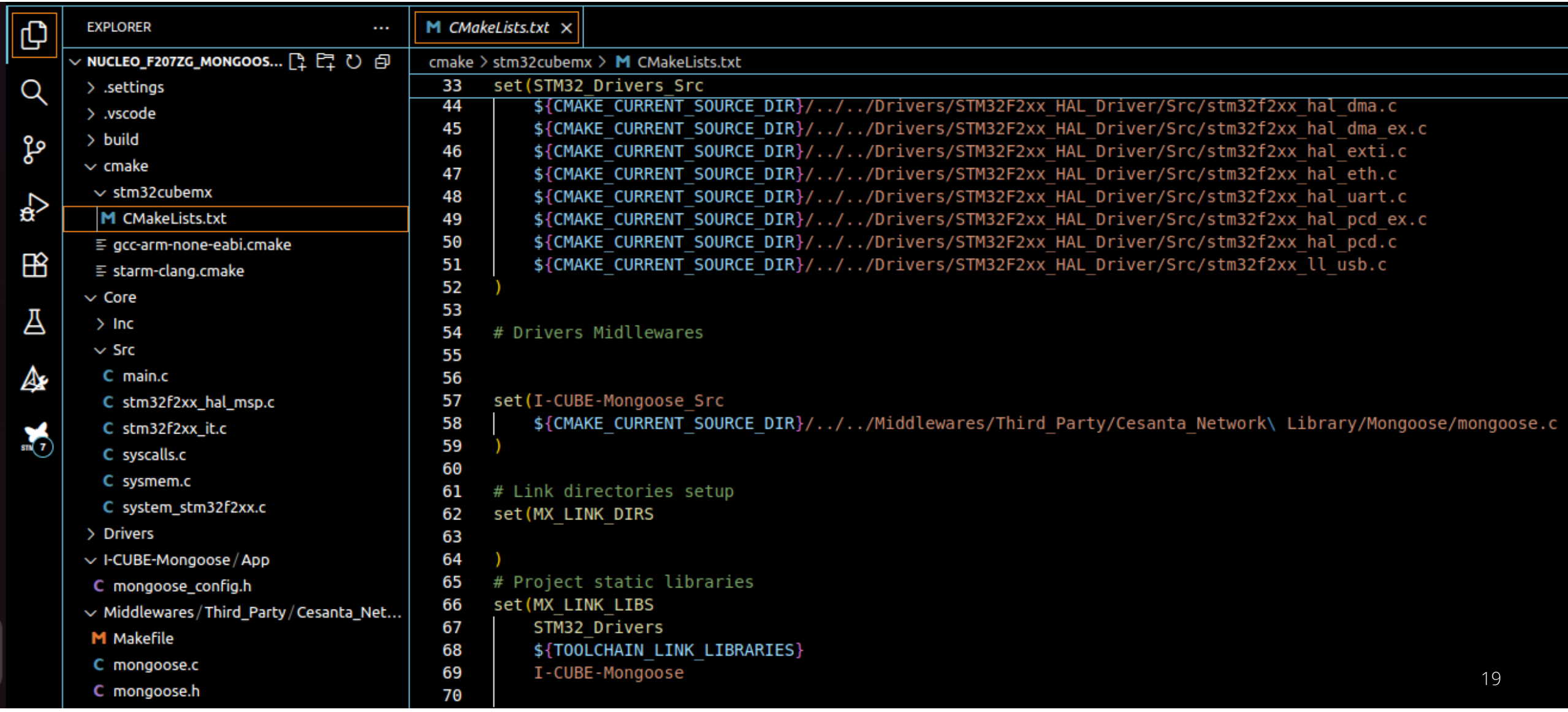
Filesystem Support

Enable packed (embedded) filesystem [x]

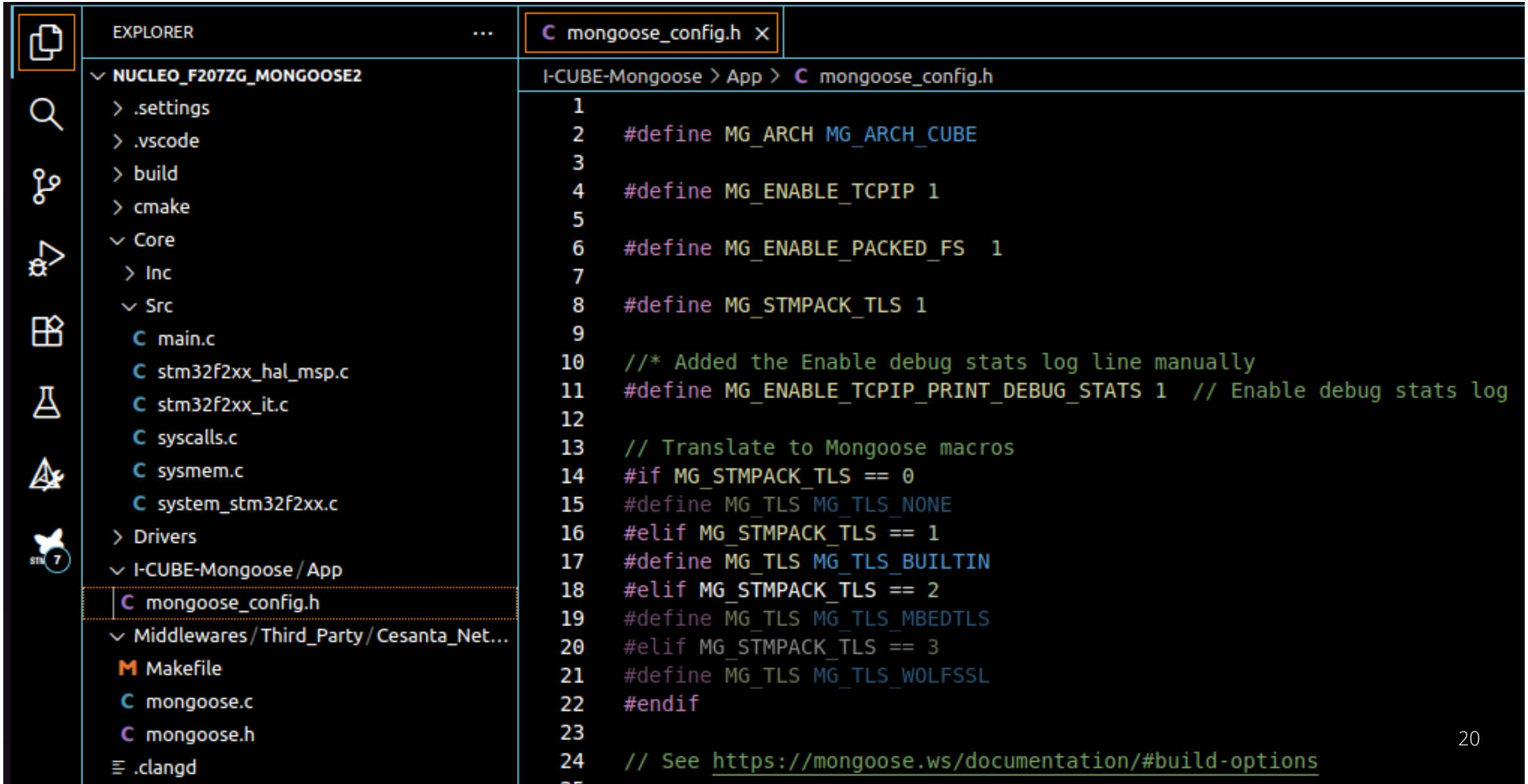
Basic Parameters

TLS library built-in

Install the STM32 Mongoose Package



Install the STM32 Mongoose Package



Run Debug – Manual Mongoose Integration

PROBLEMS 1 OUTPUT DEBUG CONSOLE TERMINAL PORTS STM32CUBE RTOS

```
68c     1 mongoose.c:20075:mg_random      Weak RNG: using rand()
691     2 mongoose.c:5434:mg_tcpip_init   MAC not set. Generated random: 02:2d:cf:46:29:04
69a     2 mongoose.c:22515:mg_phy_init    PHY ID: 0x07 0xc131 (LAN87x)
6a1     1 mongoose.c:20075:mg_random      Weak RNG: using rand()
6a6     2 mongoose.c:4140:mg_mgr_init     Driver: stm32f, MAC: 02:2d:cf:46:29:04
6ae     3 mongoose.c:4147:mg_mgr_init     MG_IO_SIZE: 512, TLS: none
6b4     2 mongoose.c:5308:mg_tcpip_poll   Status: down, IP: 0.0.0.0, rx:0, tx:0, dr:0, er:0
6bc     1 mongoose.c:5337:mg_tcpip_poll   Network is down
a89     2 mongoose.c:5308:mg_tcpip_poll   Status: down, IP: 0.0.0.0, rx:0, tx:0, dr:0, er:0
a91     1 mongoose.c:5337:mg_tcpip_poll   Network is down
e71     2 mongoose.c:5308:mg_tcpip_poll   Status: down, IP: 0.0.0.0, rx:0, tx:0, dr:0, er:0
e79     3 mongoose.c:24231:mg_tcpip_driv  Link is 100M full-duplex
e7f     3 mongoose.c:4521:tx_dhcp_discov  DHCP discover sent. Our MAC: 02:2d:cf:46:29:04
e87     3 mongoose.c:4500:tx_dhcp_reques  DHCP req sent
e8f     2 mongoose.c:4645:rx_dhcp_client  Lease: 86400 sec (86403)
e94     1 mongoose.c:20075:mg_random      Weak RNG: using rand()
e9b     2 mongoose.c:4403:onstatechange   READY, IP: 192.168.1.184
ea1     2 mongoose.c:4404:onstatechange         GW: 192.168.1.1
ea6     2 mongoose.c:4405:onstatechange        MAC: 02:2d:cf:46:29:04
1259    2 mongoose.c:5308:mg_tcpip_poll   Status: ready, IP: 192.168.1.184, rx:6, tx:3, dr:0, er:0
1641    2 mongoose.c:5308:mg_tcpip_poll   Status: ready, IP: 192.168.1.184, rx:10, tx:3, dr:0, er:0
```

Run Debug – STM32 Mongoose Package Integration

PROBLEMS 1 OUTPUT DEBUG CONSOLE TERMINAL PORTS STM32CUBE RTOS

```
61a     2 mongoose.c:22174:mg_phy_init   PHY ID: 0x07 0xc131 (LAN87x)
621     1 mongoose.c:19853:mg_random     Weak RNG: using rand()
627     2 mongoose.c:4139:mg_mgr_init    Driver: stm32f, MAC: 2a:d3:94:0a:5e:1e
62e     3 mongoose.c:4146:mg_mgr_init    MG_IO_SIZE: 512, TLS: builtin
634     2 mongoose.c:5126:mg_tcpip_poll  Status: down, IP: 0.0.0.0, rx:0, tx:0, dr:0, er:0
63c     1 mongoose.c:5154:mg_tcpip_poll  Network is down
a09     2 mongoose.c:5126:mg_tcpip_poll  Status: down, IP: 0.0.0.0, rx:0, tx:0, dr:0, er:0
a11     1 mongoose.c:5154:mg_tcpip_poll  Network is down
df1     2 mongoose.c:5126:mg_tcpip_poll  Status: down, IP: 0.0.0.0, rx:0, tx:0, dr:0, er:0
df9     3 mongoose.c:23871:mg_tcpip_driv Link is 100M full-duplex
dff     3 mongoose.c:4484:tx_dhcp_discov DHCP discover sent. Our MAC: 2a:d3:94:0a:5e:1e
e07     3 mongoose.c:4463:tx_dhcp_reques DHCP req sent
e0f     2 mongoose.c:4608:rx_dhcp_client Lease: 86400 sec (86403)
e14     1 mongoose.c:19853:mg_random     Weak RNG: using rand()
e1b     2 mongoose.c:4366:onstatechange  READY, IP: 192.168.1.194
e20     2 mongoose.c:4367:onstatechange         GW: 192.168.1.1
e26     2 mongoose.c:4368:onstatechange        MAC: 2a:d3:94:0a:5e:1e
11d9    2 mongoose.c:5126:mg_tcpip_poll  Status: ready, IP: 192.168.1.194, rx:6, tx:3, dr:0, er:0
15c1    2 mongoose.c:5126:mg_tcpip_poll  Status: ready, IP: 192.168.1.194, rx:6, tx:3, dr:0, er:0
19a9    2 mongoose.c:5126:mg_tcpip_poll  Status: ready, IP: 192.168.1.194, rx:10, tx:3, dr:0, er:0
1d91    2 mongoose.c:5126:mg_tcpip_poll  Status: ready, IP: 192.168.1.194, rx:12, tx:3, dr:0, er:0
2179    2 mongoose.c:5126:mg_tcpip_poll  Status: ready, IP: 192.168.1.194, rx:14, tx:3, dr:0, er:0
```

Next Time…

MORE TO COME..

Thank you for attending!!!

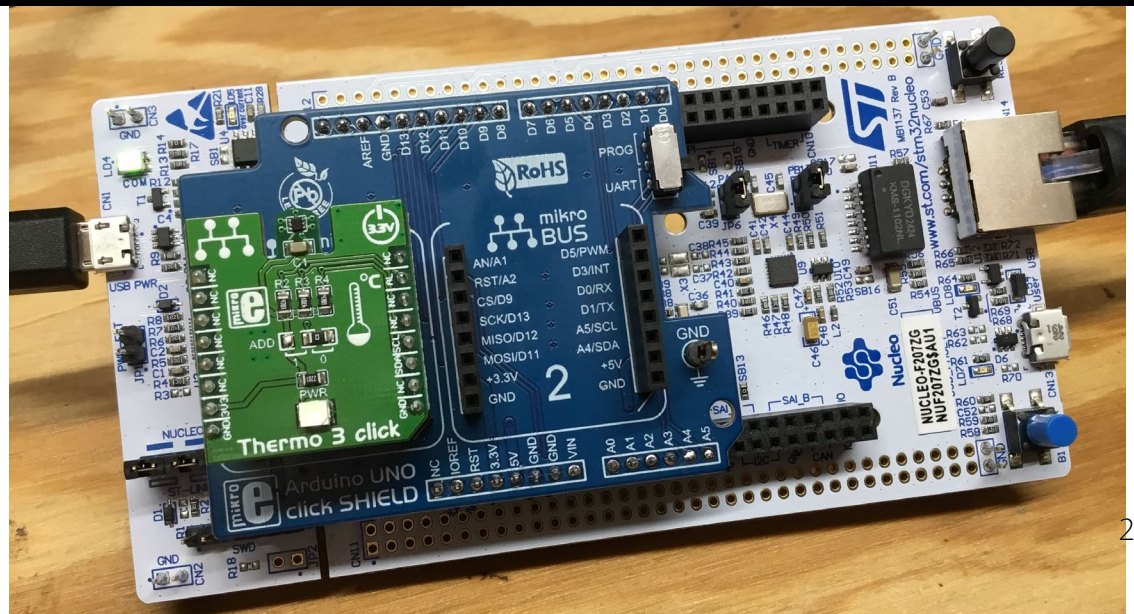
PROBLEMS 17 OUTPUT DEBUG CONSOLE TERMINAL PORTS STM32CUBE RTOS

```
bc466  2 main.c:95:server_fn            INFO: SERVER RECEIVED DATA: GET TEMPERATURE
bc46e  2 tmp102.c:82:tmp102_read_temper INFO: 2 bytes were read-> rxBuf[0] 0x1a -- rxBuf[1] 0x50
bc478  2 tmp102.c:87:tmp102_read_temper INFO: 16-bit value = 0x01a5
bc47f  2 main.c:167:server_fn           INFO: Current Temperature -> 26.31 deg C


bd68a  3 mongoose.c:4521:rx_arp         ARP: tell 192.168.1.235 we're 2a:d3:94:0a:5e:1e
d35d6  3 mongoose.c:4521:rx_arp         ARP: tell 192.168.1.235 we're 2a:d3:94:0a:5e:1e
e971a  3 mongoose.c:4521:rx_arp         ARP: tell 192.168.1.235 we're 2a:d3:94:0a:5e:1e
ff672  3 mongoose.c:4521:rx_arp         ARP: tell 192.168.1.235 we're 2a:d3:94:0a:5e:1e
1155c6 3 mongoose.c:4521:rx_arp         ARP: tell 192.168.1.235 we're 2a:d3:94:0a:5e:1e
```

Please consider the resources below:

- Today's Download Package
- www.st.com
- digikey.com



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