

Module 4: GUI Display with LVGL

Learning Objectives

- Create LVGL project
- Configure I2C pins
- Enable fonts
- Write UI code
- Display sensor data graphically

4.1 LVGL Project Creation

- Project Name: Edgi_Talk_M55_LVGL
- Board: PSOC_E84-EDGI-TALK | BSP: 1.2.1

New Project

Create RT-Thread Project

Input project name, choose RT-Thread version and select one Board and choose template or example.

Project name:

☒ Use default location

Location:

☐ Base On MCU ☒ Base On Board

Board :

BSP :

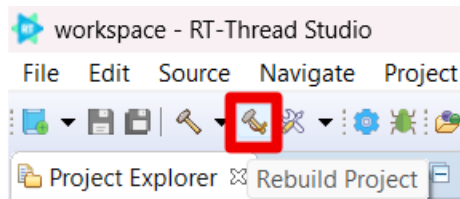
Type :

Example :

RT-Thread :

Adapter : Port :

- Click the **Hammer button** in Studio to compile.

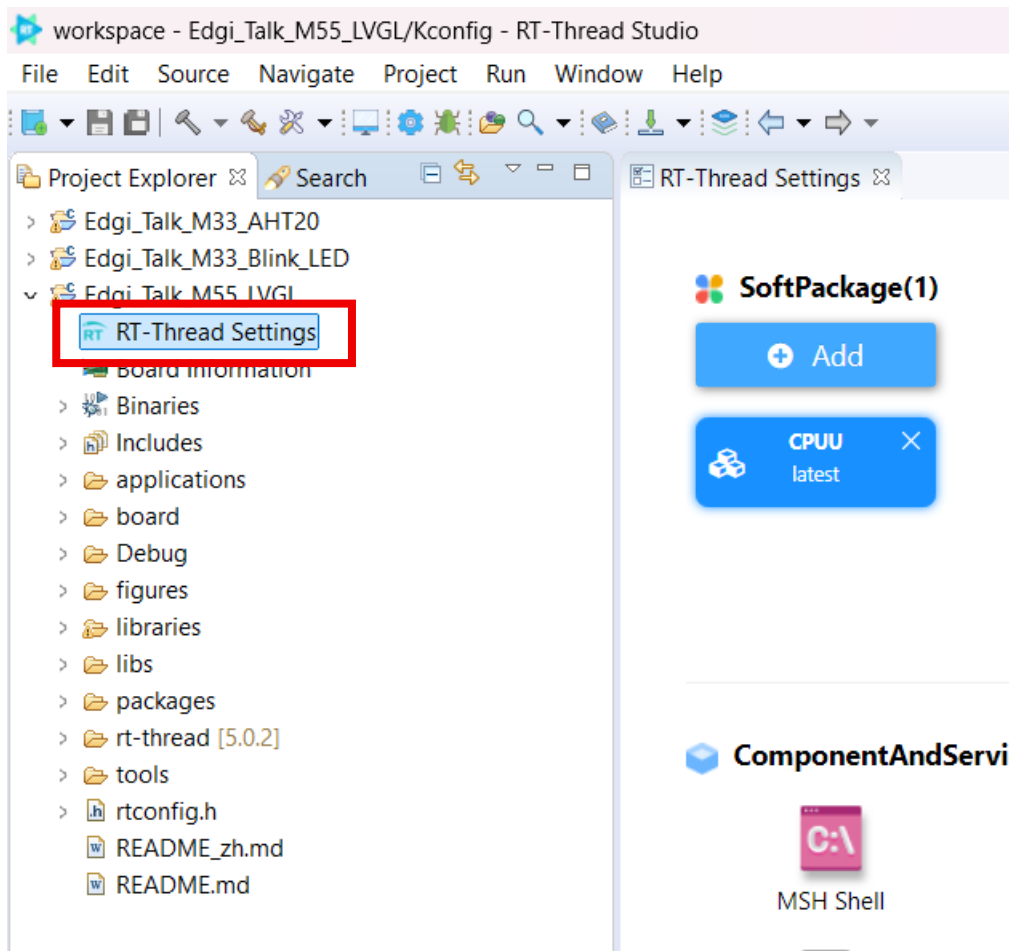


- Firmware Flashing:** Click the **Download button** in Studio to flash the firmware.



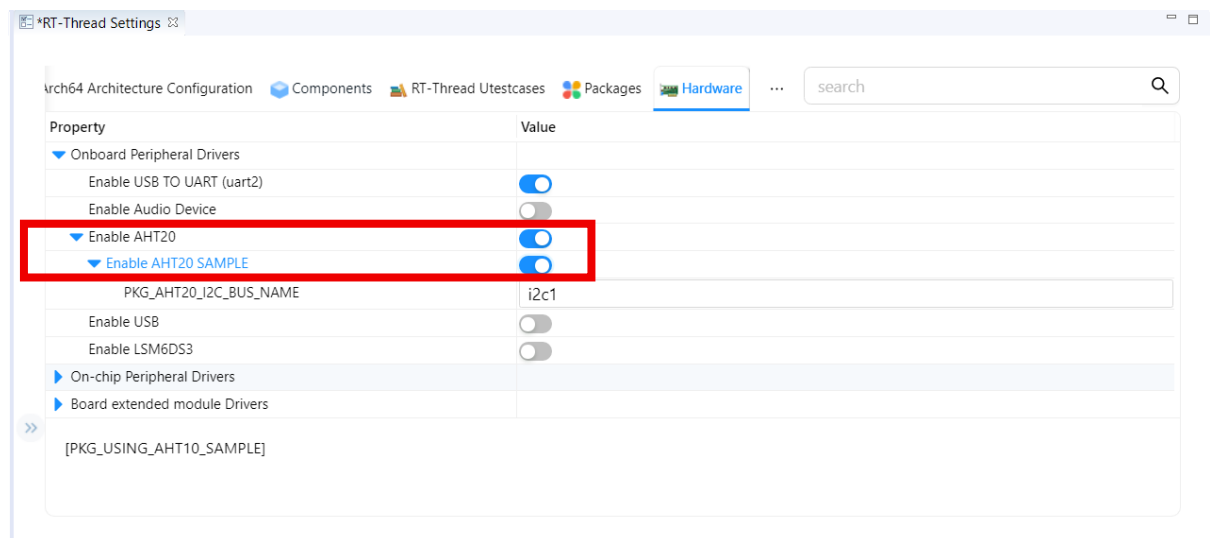
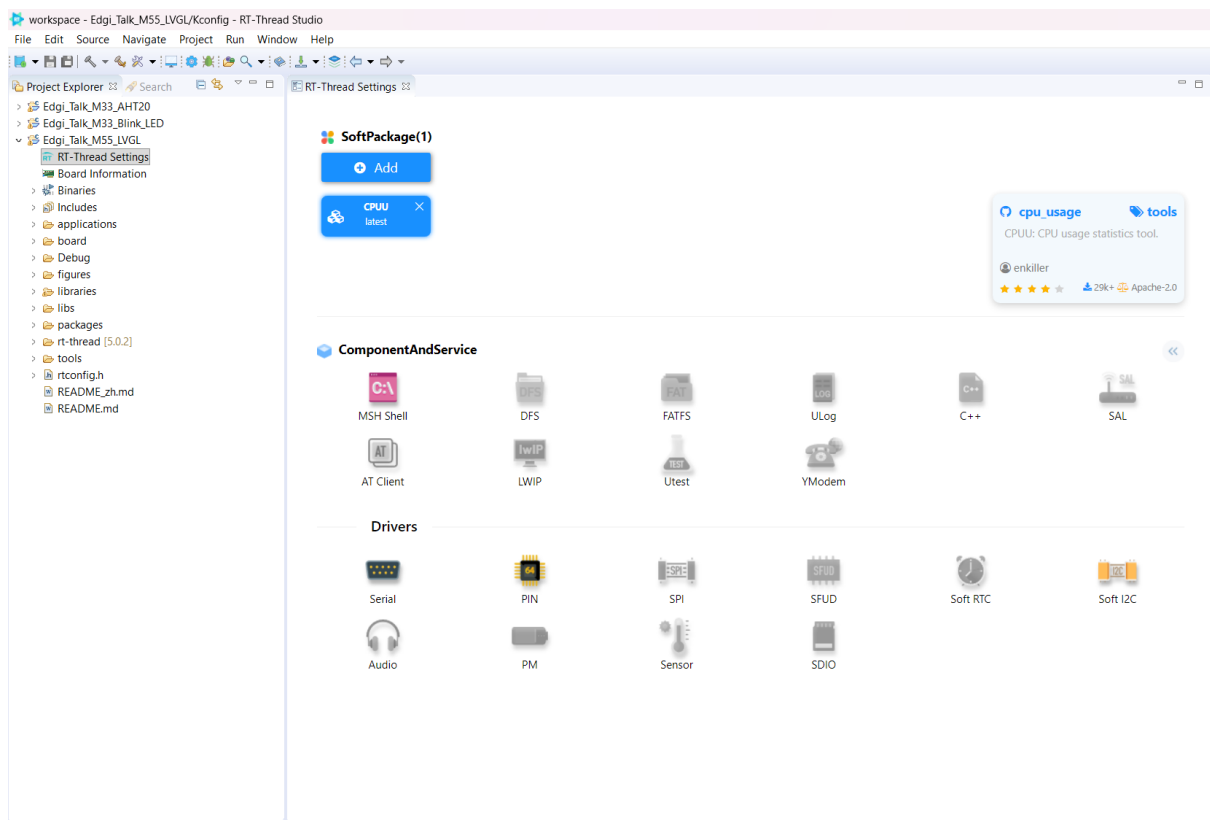
4.2 Menuconfig Configuration

Open **RT-Thread Settings**:



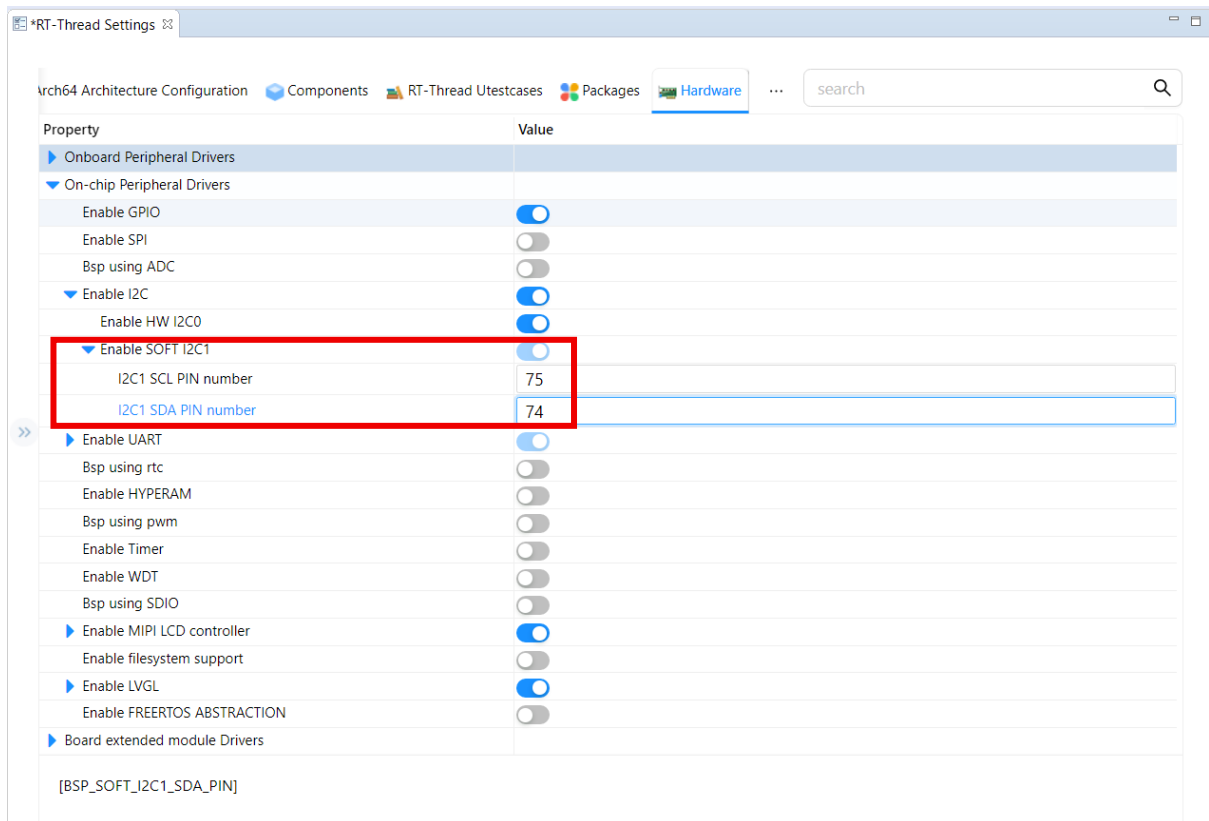
4.3 Enable AHT20

Enable AHT20 driver in menuconfig.



4.4 Modify I2C1 Pins

Set I2C1 pins to **75 (SCL)** and **74 (SDA)**.

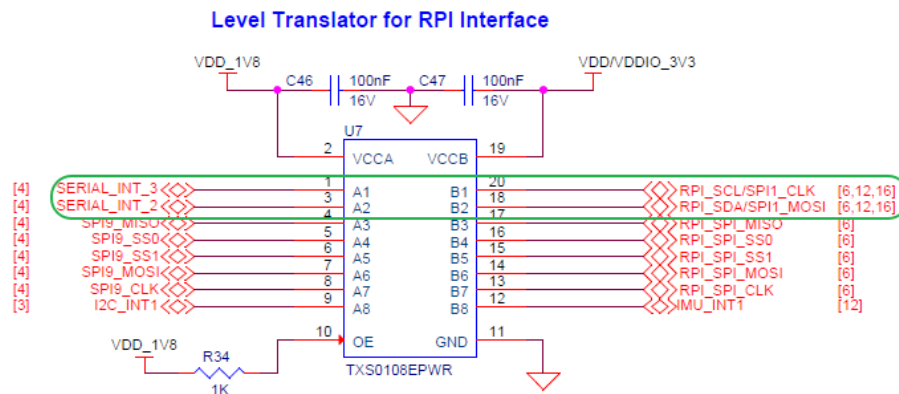


The screenshot shows the RT-Thread Settings window with the 'Hardware' tab selected. The 'On-chip Peripheral Drivers' section is expanded, and the 'Enable SOFT I2C1' option is selected. The 'I2C1 SCL PIN number' is set to 75 and the 'I2C1 SDA PIN number' is set to 74. A red box highlights these two settings.

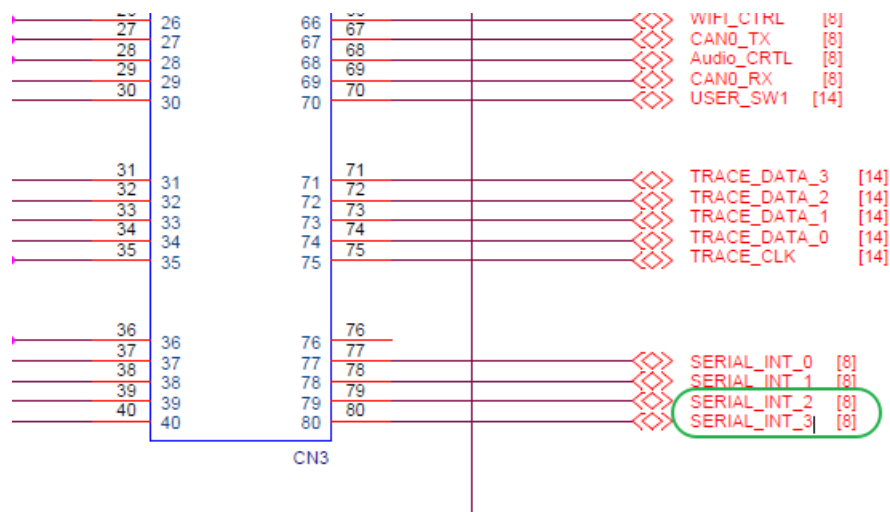
Property	Value
Onboard Peripheral Drivers	
On-chip Peripheral Drivers	
Enable GPIO	☒
Enable SPI	☐
Bsp using ADC	☐
Enable I2C	☒
Enable HW I2C0	☒
Enable SOFT I2C1	☒
I2C1 SCL PIN number	75
I2C1 SDA PIN number	74
Enable UART	☒
Bsp using rtc	☐
Enable HYPERAM	☐
Bsp using pwm	☐
Enable Timer	☐
Enable WDT	☐
Bsp using SDIO	☐
Enable MIPI LCD controller	☒
Enable filesystem support	☐
Enable LVGL	☒
Enable FREERTOS ABSTRACTION	☐
Board extended module Drivers	

[BSP_SOFT_I2C1_SDA_PIN]

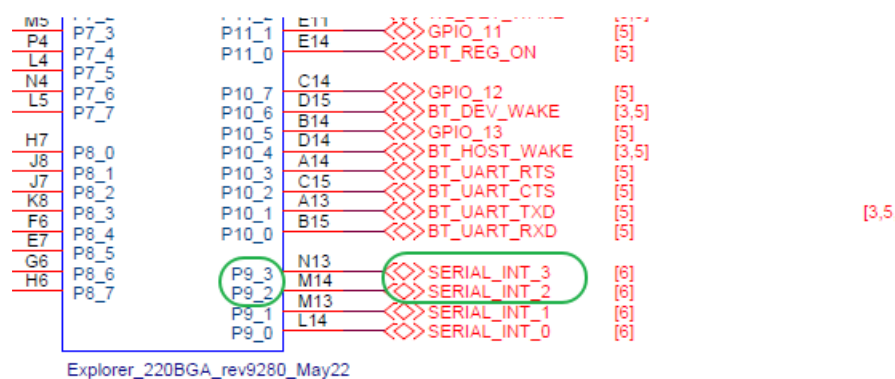
4.4.1 Level Translator



4.4.2 BTB Socket



4.4.3 MCU Pins



4.5. Enable printf Floating Point Support

The screenshot displays the RT-Thread Studio IDE interface. The top menu bar includes File, Edit, Source, Navigate, Project, Run, Window, and Help. The Project Explorer on the left shows a project named 'Edgi_Talk_M55_LVGL' with a sub-item 'RT-Thread Settings' highlighted. The main workspace shows the 'RT-Thread Settings' dialog, which includes a 'SoftPackage(2)' section with an 'Add' button highlighted by a red box. Below this, there are two installed packages: 'AHT10 latest' and 'CPUU latest'. The 'ComponentAndService' section shows icons for 'MSH Shell', 'DFS', 'AT', and 'lwIP'. At the bottom, the 'RT-Thread Package Center' window is open, showing search results for 'vsnprintf'. The search results list 'rt_vsnprintf_full' as the 'fully functional version of rt_vsnprintf', created by 'Meco Man' with a 5-star rating. The package is marked as 'latest' and has 141604 Apache-2.0 licenses. A '+Add' button is highlighted with a red box.

workspace - Edgi_Talk_M55_LVGL/Kconfig - RT-Thread Studio

File Edit Source Navigate Project Run Window Help

Project Explorer Search

- Edgi_Talk_M33_AHT20
- Edgi_Talk_M33_Blink_LED
- Edgi_Talk_M55_LVGL [Active - Debug]
 - RT-Thread Settings
 - Board Information
 - Binaries
 - Includes
 - __pycache__
 - applications
 - board
 - Debug
 - figures
 - libraries
 - libs
 - packages
 - rt-thread [5.0.2]
 - tools
 - rtconfig.h
 - README_zh.md
 - README.md

RT-Thread Settings

SoftPackage(2)

+ Add

AHT10 latest CPUU latest

ComponentAndService

MSH Shell DFS AT lwIP

Document - Package Center

RT-Thread Package vsnprintf

Home / 1 Results

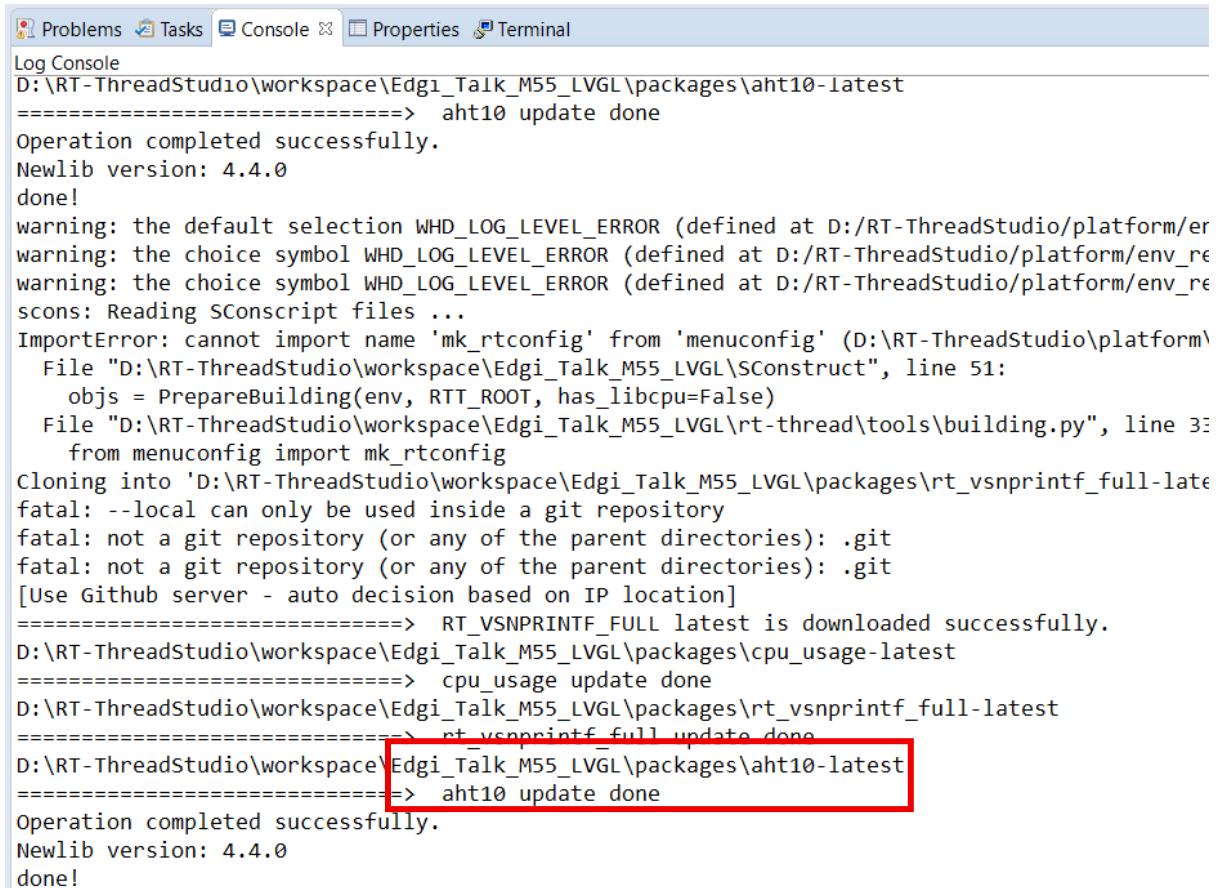
rt_vsnprintf_full
fully functional version of rt_vsnprintf

Meco Man latest
★★★★★ 141604 Apache-2.0

+Add

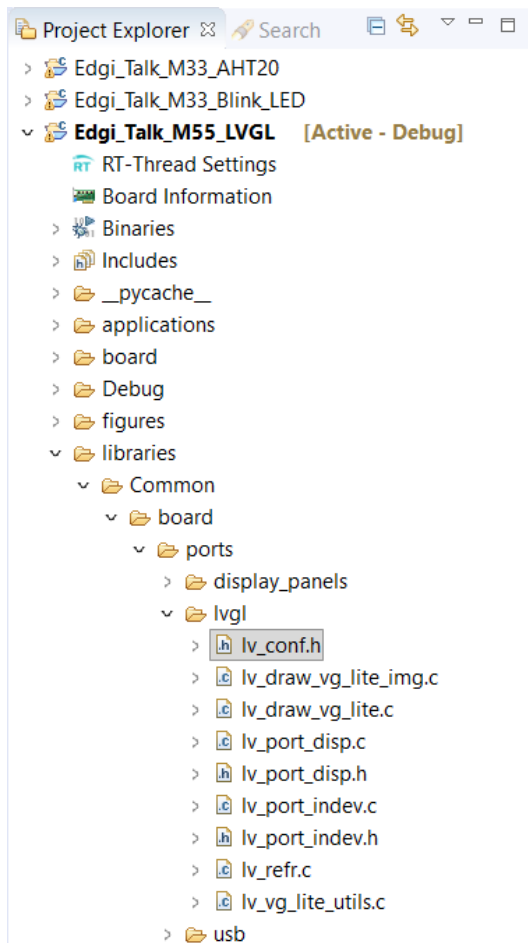
Ctrl+S to Save

4.6. Update Software Packages



```
Log Console
D:\RT-ThreadStudio\workspace\Edgi_Talk_M55_LVGL\packages\aed10-latest
====> aht10 update done
Operation completed successfully.
Newlib version: 4.4.0
done!
warning: the default selection WHD_LOG_LEVEL_ERROR (defined at D:/RT-ThreadStudio/platform/er
warning: the choice symbol WHD_LOG_LEVEL_ERROR (defined at D:/RT-ThreadStudio/platform/env_re
warning: the choice symbol WHD_LOG_LEVEL_ERROR (defined at D:/RT-ThreadStudio/platform/env_re
scons: Reading SConstruct files ...
ImportError: cannot import name 'mk_rtconfig' from 'menuconfig' (D:\RT-ThreadStudio\platform\
  File "D:\RT-ThreadStudio\workspace\Edgi_Talk_M55_LVGL\SConstruct", line 51:
    objs = PrepareBuilding(env, RTT_ROOT, has_libcpu=False)
  File "D:\RT-ThreadStudio\workspace\Edgi_Talk_M55_LVGL\rt-thread\tools\building.py", line 33:
    from menuconfig import mk_rtconfig
Cloning into 'D:\RT-ThreadStudio\workspace\Edgi_Talk_M55_LVGL\packages\rt_vsnprintf_full-late
fatal: --local can only be used inside a git repository
fatal: not a git repository (or any of the parent directories): .git
fatal: not a git repository (or any of the parent directories): .git
[Use Github server - auto decision based on IP location]
====> RT_VSNPRINTF_FULL latest is downloaded successfully.
D:\RT-ThreadStudio\workspace\Edgi_Talk_M55_LVGL\packages\cpu_usage-latest
====> cpu_usage update done
D:\RT-ThreadStudio\workspace\Edgi_Talk_M55_LVGL\packages\rt_vsnprintf_full-latest
====> rt_vsnprintf_full update done
D:\RT-ThreadStudio\workspace\Edgi_Talk_M55_LVGL\packages\aed10-latest
====> aht10 update done
Operation completed successfully.
Newlib version: 4.4.0
done!
```

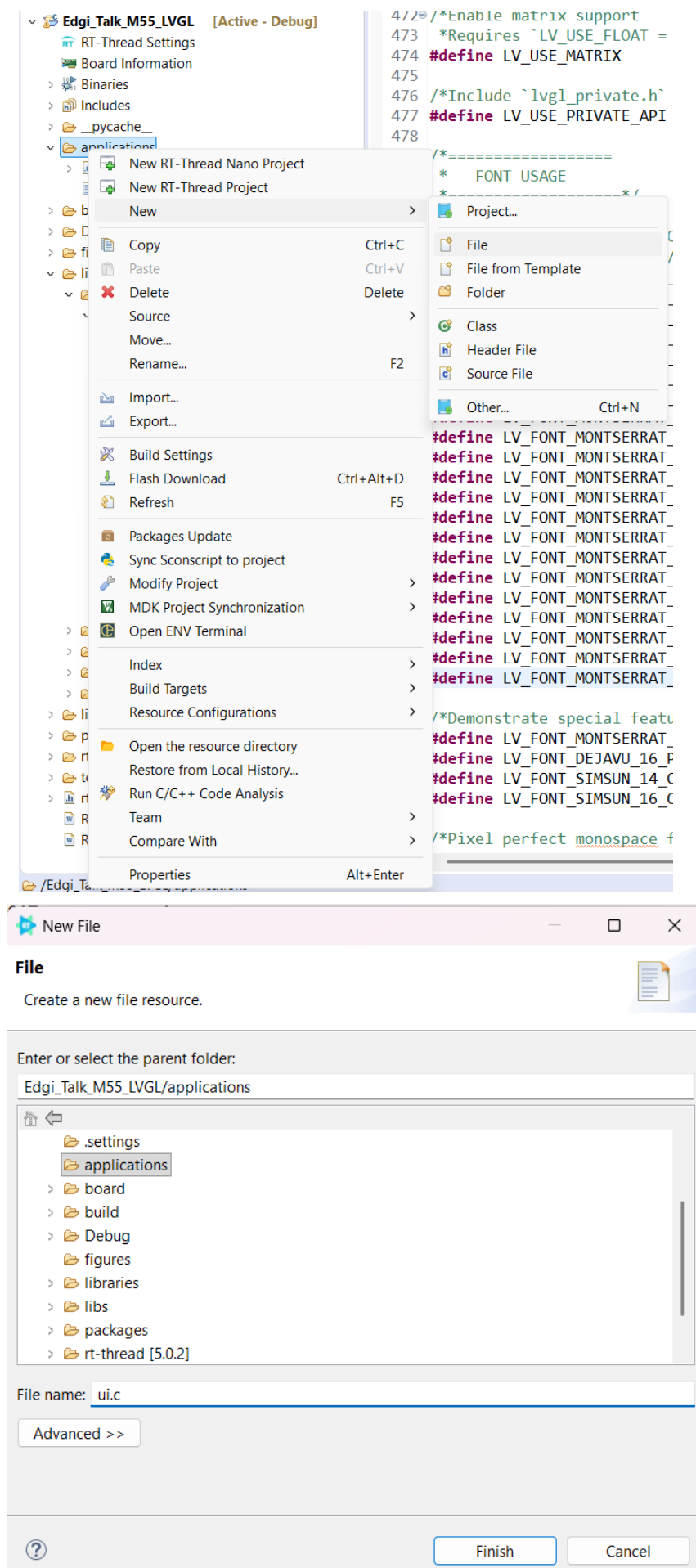
4.7 Configure lv_conf.h to Enable Font Sizes 28 and 48



```
483 /*Montserrat fonts with ASCII range and some symbols using bpp = 4
484 *https://fonts.google.com/specimen/Montserrat*/
485 #define LV_FONT_MONTERRAT_8 0
486 #define LV_FONT_MONTERRAT_10 0
487 #define LV_FONT_MONTERRAT_12 1
488 #define LV_FONT_MONTERRAT_14 1
489 #define LV_FONT_MONTERRAT_16 1
490 #define LV_FONT_MONTERRAT_18 0
491 #define LV_FONT_MONTERRAT_20 1
492 #define LV_FONT_MONTERRAT_22 1
493 #define LV_FONT_MONTERRAT_24 1
494 #define LV_FONT_MONTERRAT_26 0
495 #define LV_FONT_MONTERRAT_28 1
496 #define LV_FONT_MONTERRAT_30 0
497 #define LV_FONT_MONTERRAT_32 0
498 #define LV_FONT_MONTERRAT_34 0
499 #define LV_FONT_MONTERRAT_36 0
500 #define LV_FONT_MONTERRAT_38 0
501 #define LV_FONT_MONTERRAT_40 0
502 #define LV_FONT_MONTERRAT_42 0
503 #define LV_FONT_MONTERRAT_44 0
504 #define LV_FONT_MONTERRAT_46 0
505 #define LV_FONT_MONTERRAT_48 1
```

Ctrl+S to Save

4.8 Create UI Display File



Coding:

```
#include "lvgl.h"
```

```
#include <stdlib.h>
```

```
#include <stdio.h>
```

```
#define MAX_POINTS 20
```

```
static lv_obj_t *label_temp_value;
```

```
static lv_obj_t *label_humi_value;
```

```
static lv_obj_t *chart;
```

```
static lv_chart_series_t *ser_temp;
```

```
static lv_chart_series_t *ser_humi;
```

```
static int32_t temp_data[MAX_POINTS];
```

```
static int32_t humi_data[MAX_POINTS];
```

```
/* Update temp/humi display and line chart */
```

```
void ui_env_update(float temp, float humi)
```

```
{
```

```
    char buf[16];
```

```
    lv_snprintf(buf, sizeof(buf), "%.1f°C", temp);
```

```
    lv_label_set_text(label_temp_value, buf);
```

```
    lv_snprintf(buf, sizeof(buf), "%.1f%%", humi);
```

```
    lv_label_set_text(label_humi_value, buf);
```

```
/* Smoothly scroll line chart */
```

```
for(int i = 0; i < MAX_POINTS - 1; i++) {
```

```

    temp_data[i] = temp_data[i+1];
    humi_data[i] = humi_data[i+1];
}
temp_data[MAX_POINTS-1] = (int32_t)temp;
humi_data[MAX_POINTS-1] = (int32_t)humi;

for(int i = 0; i < MAX_POINTS; i++) {
    lv_chart_set_value_by_id(chart, ser_temp, i, temp_data[i]);
    lv_chart_set_value_by_id(chart, ser_humi, i, humi_data[i]);
}
}

/* Create interface */
void ui_env_create(void)
{
    lv_obj_t *scr = lv_scr_act();
    /* Background Gradient */
    lv_obj_set_style_bg_color(scr, lv_color_hex(0x4A90E2), 0);
    lv_obj_set_style_bg_grad_color(scr, lv_color_hex(0x50E3C2), 0);
    lv_obj_set_style_bg_grad_dir(scr, LV_GRAD_DIR_VER, 0);
    /* Top Title */
    lv_obj_t *label_title = lv_label_create(scr);
    lv_label_set_text(label_title, "Environment Monitor");
    lv_obj_set_style_text_font(label_title, &lv_font_montserrat_28, 0);
    lv_obj_set_style_text_color(label_title, lv_color_white(), 0);
    lv_obj_align(label_title, LV_ALIGN_TOP_MID, 16, 16);

    /* Temperature Card */

```

```
lv_obj_t *card_temp = lv_obj_create(scr);  
lv_obj_set_size(card_temp, 220, 220);  
lv_obj_set_style_radius(card_temp, 24, 0);  
lv_obj_set_style_bg_color(card_temp, lv_color_white(), 0);  
lv_obj_set_style_shadow_width(card_temp, 12, 0);  
lv_obj_set_style_shadow_color(card_temp, lv_color_hex(0x888888), 0);  
lv_obj_align(card_temp, LV_ALIGN_LEFT_MID, 15, 0);  
lv_obj_clear_flag(card_temp, LV_OBJ_FLAG_CLICKABLE |  
LV_OBJ_FLAG_SCROLLABLE);
```

```
lv_obj_t *icon_temp = lv_label_create(card_temp);  
lv_label_set_text(icon_temp, LV_SYMBOL_WARNING);  
lv_obj_set_style_text_font(icon_temp, &lv_font_montserrat_28, 0);  
lv_obj_set_style_text_color(icon_temp, lv_color_hex(0xFF6B6B), 0);  
lv_obj_align(icon_temp, LV_ALIGN_TOP_LEFT, 15, 15);
```

```
lv_obj_t *label_temp = lv_label_create(card_temp);  
lv_label_set_text(label_temp, "Temperature");  
lv_obj_set_style_text_font(label_temp, &lv_font_montserrat_22, 0);  
lv_obj_set_style_text_color(label_temp, lv_color_black(), 0);  
lv_obj_align(label_temp, LV_ALIGN_TOP_LEFT, 50, 20);
```

```
label_temp_value = lv_label_create(card_temp);  
lv_label_set_text(label_temp_value, "--°C");  
lv_obj_set_style_text_font(label_temp_value, &lv_font_montserrat_48, 0);  
lv_obj_set_style_text_color(label_temp_value, lv_color_hex(0xFF6B6B), 0);  
lv_obj_align(label_temp_value, LV_ALIGN_BOTTOM_LEFT, 15, -20);
```

```

/* Humidity Card */

lv_obj_t *card_humi = lv_obj_create(scr);

lv_obj_set_size(card_humi, 220, 220);

lv_obj_set_style_radius(card_humi, 24, 0);

lv_obj_set_style_bg_color(card_humi, lv_color_white(), 0);

lv_obj_set_style_shadow_width(card_humi, 12, 0);

lv_obj_set_style_shadow_color(card_humi, lv_color_hex(0x888888), 0);

lv_obj_align(card_humi, LV_ALIGN_RIGHT_MID, -15, 0);


lv_obj_t *icon_humi = lv_label_create(card_humi);

lv_label_set_text(icon_humi, LV_SYMBOL_HOME);

lv_obj_set_style_text_font(icon_humi, &lv_font_montserrat_28, 0);

lv_obj_set_style_text_color(icon_humi, lv_color_hex(0x4A90E2), 0);

lv_obj_align(icon_humi, LV_ALIGN_TOP_LEFT, 15, 15);


lv_obj_t *label_humi = lv_label_create(card_humi);

lv_label_set_text(label_humi, "Humidity");

lv_obj_set_style_text_font(label_humi, &lv_font_montserrat_22, 0);

lv_obj_set_style_text_color(label_humi, lv_color_black(), 0);

lv_obj_align(label_humi, LV_ALIGN_TOP_LEFT, 50, 20);


label_humi_value = lv_label_create(card_humi);

lv_label_set_text(label_humi_value, "--%");

lv_obj_set_style_text_font(label_humi_value, &lv_font_montserrat_48, 0);

lv_obj_set_style_text_color(label_humi_value, lv_color_hex(0x4A90E2), 0);

lv_obj_align(label_humi_value, LV_ALIGN_BOTTOM_LEFT, 15, -20);

lv_obj_clear_flag(card_humi, LV_OBJ_FLAG_CLICKABLE |
LV_OBJ_FLAG_SCROLLABLE);

```

```

/* Line Chart */

chart = lv_chart_create(scr);

lv_obj_set_size(chart, 420, 250);

lv_obj_align(chart, LV_ALIGN_BOTTOM_MID, 0, -20);

lv_chart_set_type(chart, LV_CHART_TYPE_LINE);

lv_chart_set_point_count(chart, MAX_POINTS);

lv_chart_set_range(chart, LV_CHART_AXIS_PRIMARY_Y, 0, 100);

lv_chart_set_div_line_count(chart, 5, 5); // Grid lines


/* Add Series */

ser_temp = lv_chart_add_series(chart, lv_color_hex(0xFF6B6B),
LV_CHART_AXIS_PRIMARY_Y);

ser_humi = lv_chart_add_series(chart, lv_color_hex(0x4A90E2),
LV_CHART_AXIS_PRIMARY_Y);


/* Hide points initially */

for(int i = 0; i < MAX_POINTS; i++) {

    temp_data[i] = LV_CHART_POINT_NONE;

    humi_data[i] = LV_CHART_POINT_NONE;

    lv_chart_set_value_by_id(chart, ser_temp, i, LV_CHART_POINT_NONE);

    lv_chart_set_value_by_id(chart, ser_humi, i, LV_CHART_POINT_NONE);

}


/* Legends */

lv_obj_t *legend_temp = lv_label_create(chart);

lv_label_set_text(legend_temp, "Temp (°C)");

lv_obj_set_style_text_color(legend_temp, lv_color_hex(0xFF6B6B), 0);

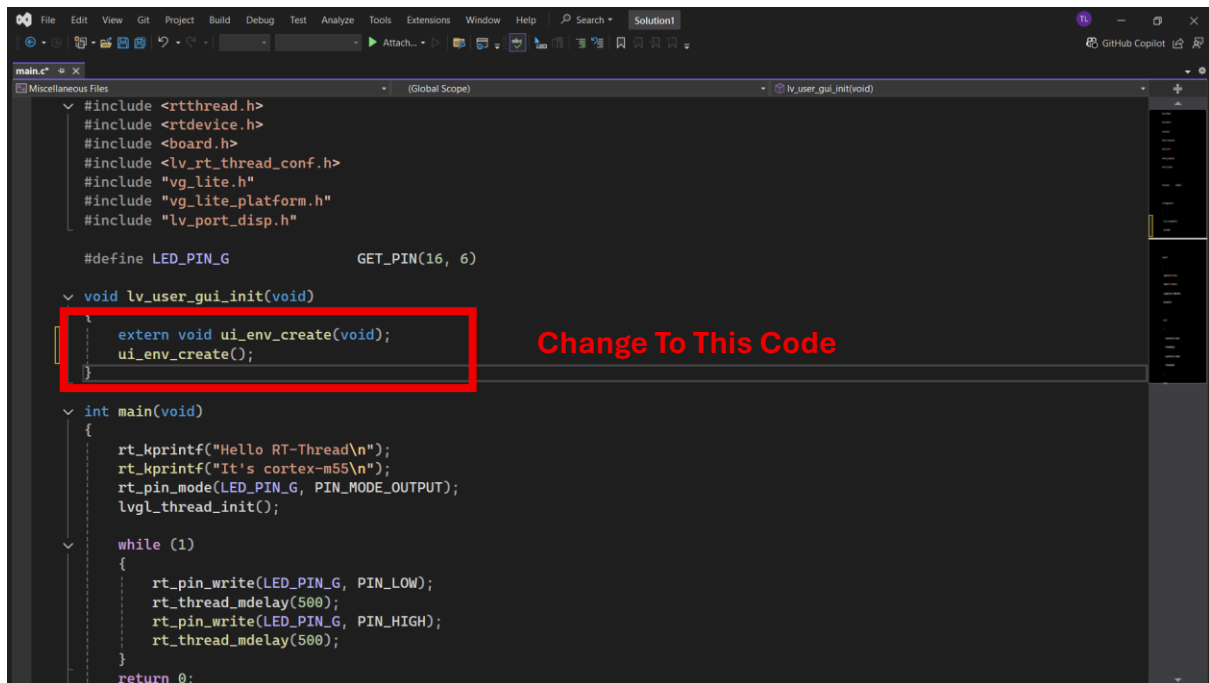
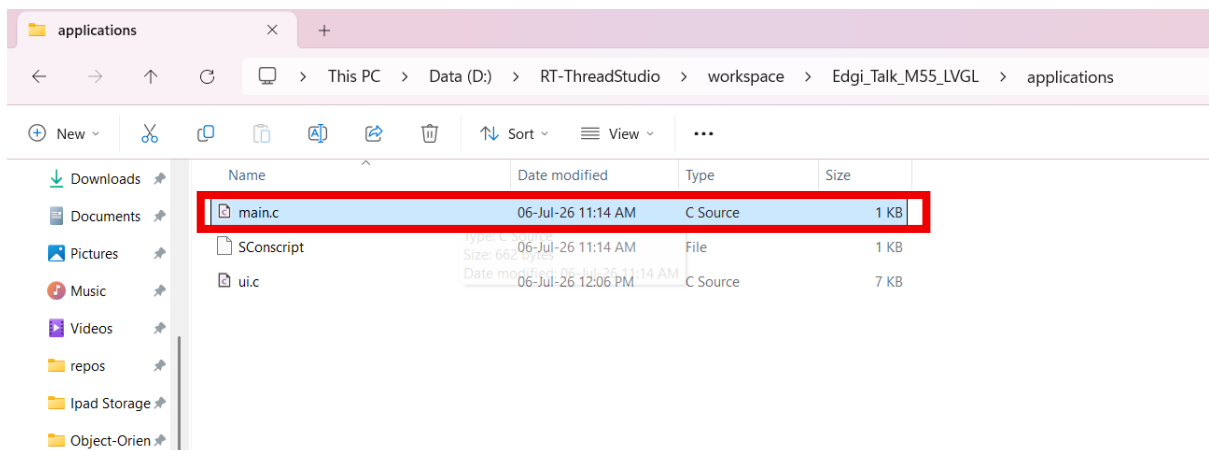
lv_obj_set_style_text_font(legend_temp, &lv_font_montserrat_16, 0);

```

```
lv_obj_align(legend_temp, LV_ALIGN_TOP_RIGHT, -80, 5);

lv_obj_t *legend_humi = lv_label_create(chart);
lv_label_set_text(legend_humi, "Humi (%)");
lv_obj_set_style_text_color(legend_humi, lv_color_hex(0x4A90E2), 0);
lv_obj_set_style_text_font(legend_humi, &lv_font_montserrat_16, 0);
lv_obj_align(legend_humi, LV_ALIGN_TOP_RIGHT, -10, 5);
}
```

4.9 Launch Custom UI



Coding:

```
#include <rtthread.h>
#include <rtdevice.h>
#include <board.h>
#include <lv_rt_thread_conf.h>
#include "vg_lite.h"
#include "vg_lite_platform.h"
#include "lv_port_disp.h"
```

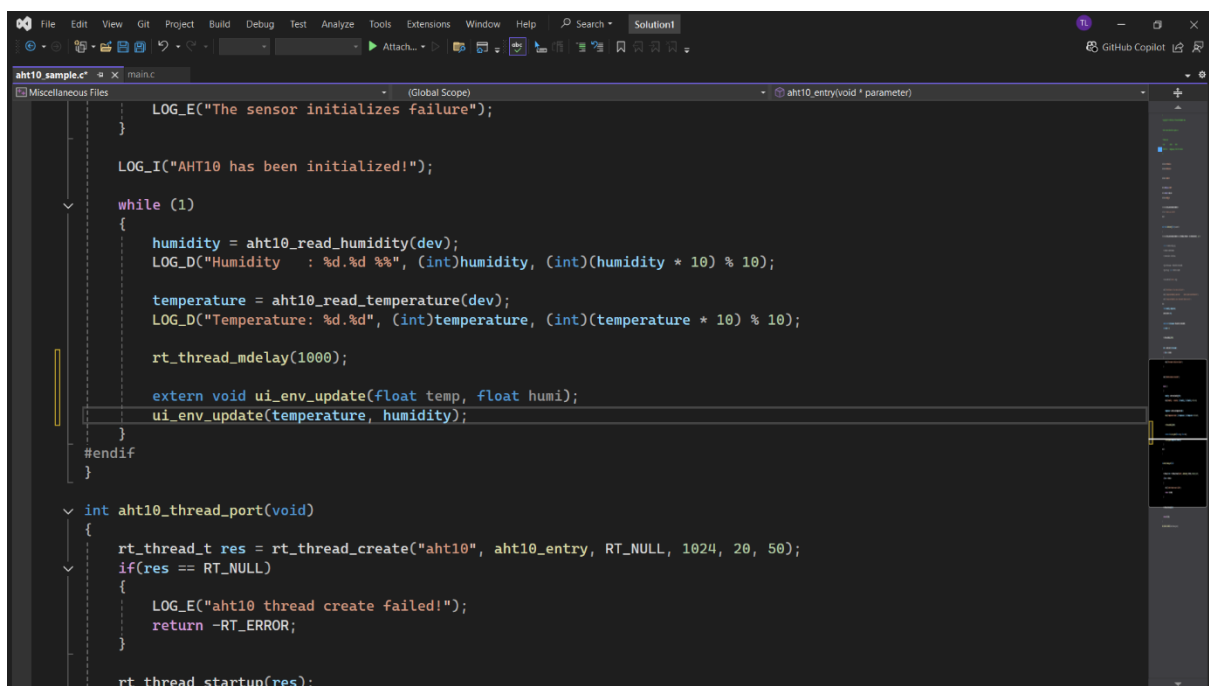
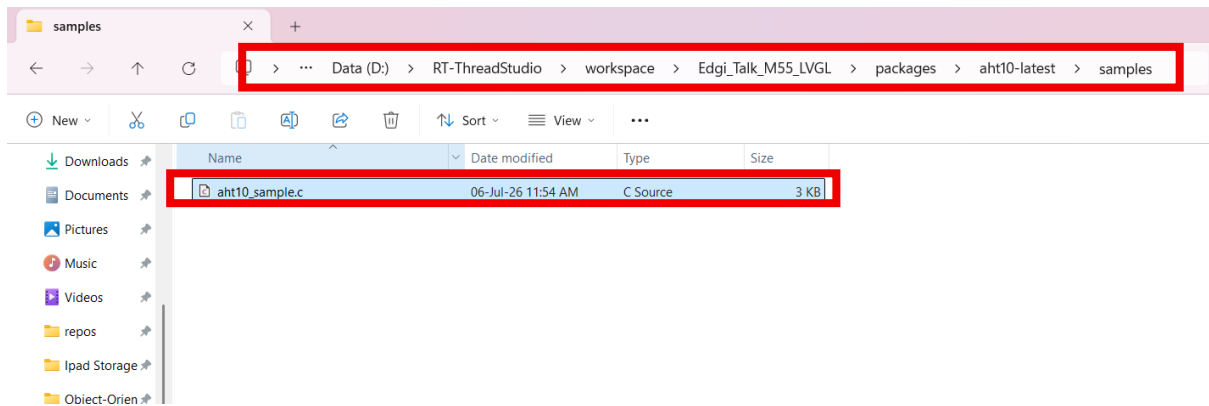
```
#define LED_PIN_G      GET_PIN(16, 6)

void lv_user_gui_init(void)
{
    extern void ui_env_create(void);
    ui_env_create();
}

int main(void)
{
    rt_kprintf("Hello RT-Thread\n");
    rt_kprintf("It's cortex-m55\n");
    rt_pin_mode(LED_PIN_G, PIN_MODE_OUTPUT);
    lvgl_thread_init();

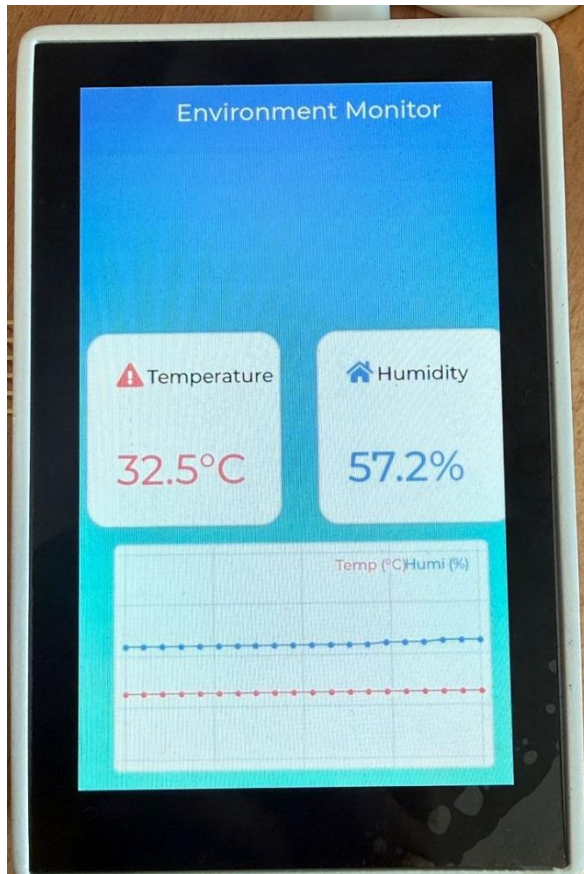
    while (1)
    {
        rt_pin_write(LED_PIN_G, PIN_LOW);
        rt_thread_mdelay(500);
        rt_pin_write(LED_PIN_G, PIN_HIGH);
        rt_thread_mdelay(500);
    }
    return 0;
}
```

4.10 Add UI Temperature/Humidity Update Link



4.11 Expected Result

GUI displays temperature/humidity with live chart.



Note: If there is nothing showing on board, check if the M33 project has correctly initialized the M55 core. Please verify the configuration item in the RT-Thread Settings for 'Select SOC Multi-Core Mode' to ensure that all relevant multi-core options have been correctly checked and enabled.

