Nirbhay Sharma (B19CSE114)

DSL - Lab -9

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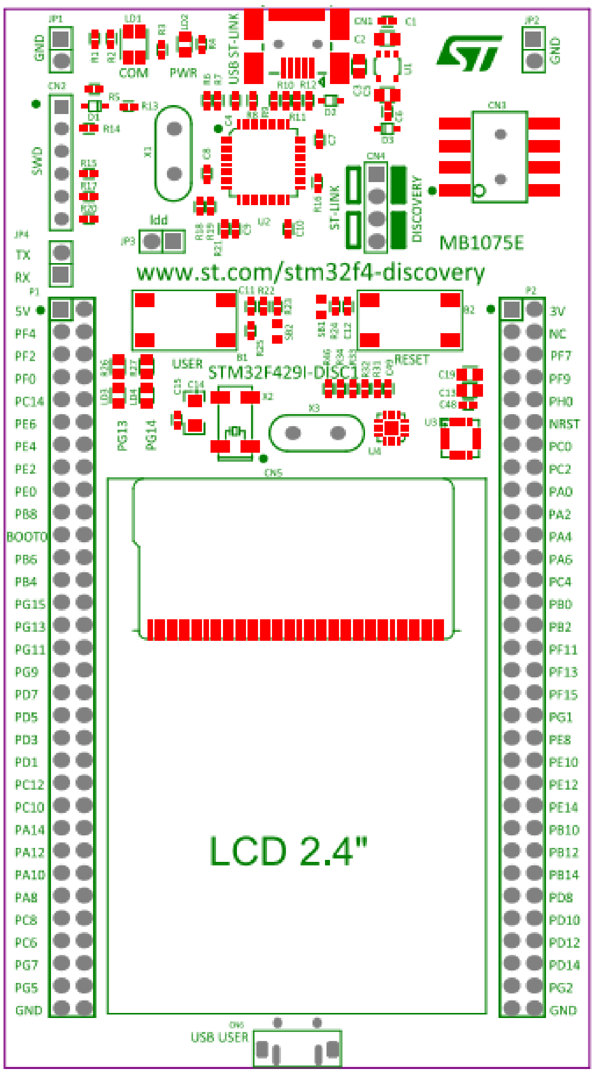
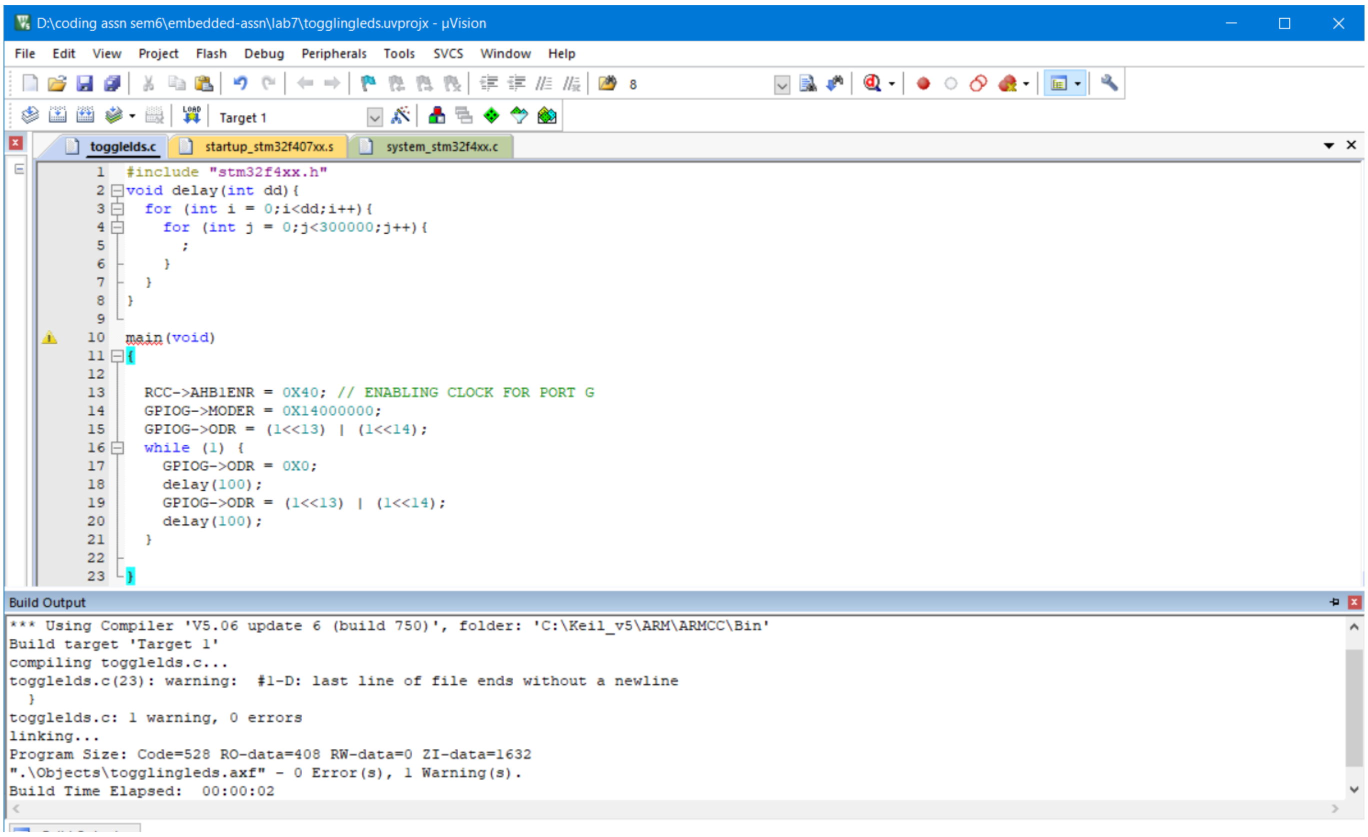
diagram for stm board



Task-1

```
#include "stm32f4xx.h"
void delay(int dd){
    for (int i = 0;i<dd;i++){
        for (int j = 0;j<300000;j++){
            ;
        }
    }
}

main(void)
{

    RCC->AHB1ENR = 0X40; // ENABLING CLOCK FOR PORT G
    GPIOG->MODER = 0X14000000;
    GPIOG->ODR = (1<<13) | (1<<14);
    while (1) {
        GPIOG->ODR = 0X0;
        delay(100);
        GPIOG->ODR = (1<<13) | (1<<14);
        delay(100);
    }

}
```


D:\coding assn sem6\embedded-assn\lab7\togglingleds.uvprojx - µVision
File Edit View Project Flash Debug Peripherals Tools SVCS Window Help
Target 1
togglelds.c
startup_stm32f407xx.s
system_stm32f4xx.c
Build Output

```
#include "stm32f4xx.h"
void delay(int dd){
  for (int i = 0;i<dd;i++){
    for (int j = 0;j<300000;j++){
      ;
    }
  }
}

main(void)
{

  RCC->AHB1ENR = 0X40; // ENABLING CLOCK FOR PORT G
  GPIOG->MODER = 0X14000000;
  GPIOG->ODR = (1<<13) | (1<<14);
  while (1) {
    GPIOG->ODR = 0X0;
    delay(100);
    GPIOG->ODR = (1<<13) | (1<<14);
    delay(100);
  }

}
```

```
*** Using Compiler 'V5.06 update 6 (build 750)', folder: 'C:\Keil_v5\ARM\ARMCC\Bin'
Build target 'Target 1'
compiling togglelds.c...
togglelds.c(23): warning:  #1-D: last line of file ends without a newline
  }
togglelds.c: 1 warning, 0 errors
linking...
Program Size: Code=528 RO-data=408 RW-data=0 ZI-data=1632
".\Objects\togglingleds.axf" - 0 Error(s), 1 Warning(s).
Build Time Elapsed:  00:00:02
```

logic

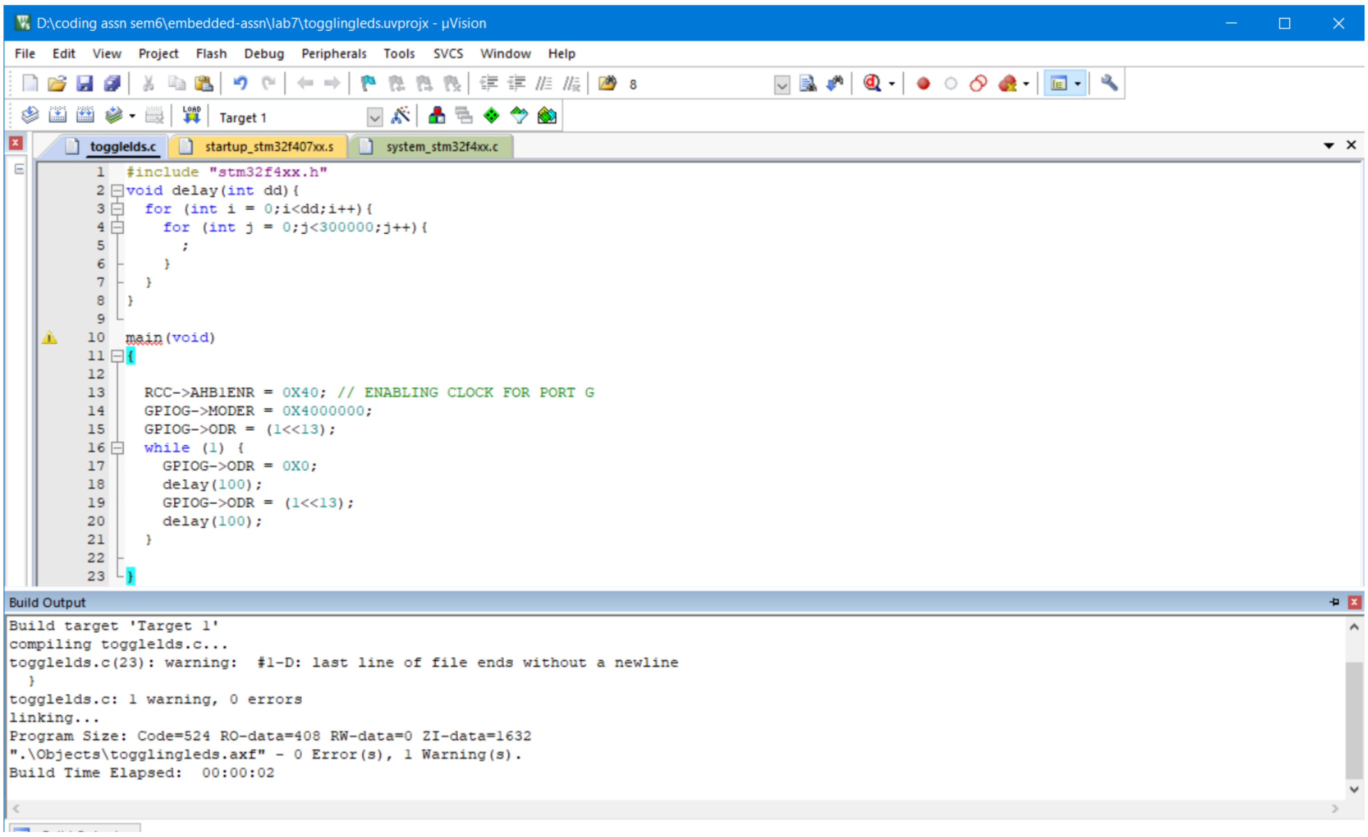
1. first set GPIOG clock using 0x40
2. then set $PG13$, $PG14$ on output mode (01) using 0x14000000
3. then set odr to $((1 << 13)|(1 << 14))$ to enable 13th and 14th pin or glow them.
4. then run a while loop and simply set the values accordingly in order to toggle led's with some delay

Task-2

https://controllerstech.com/pwm-in-stm32/

part-a

```
#include "stm32f4xx.h"
void delay(int dd){
    for (int i = 0;i<dd;i++){
        for (int j = 0;j<300000;j++){
            ;
        }
    }
}

main(void)
{

    RCC->AHB1ENR = 0X40; // ENABLING CLOCK FOR PORT G
    GPIOG->MODER = 0X4000000;
    GPIOG->ODR = (1<<13);
    while (1) {
        GPIOG->ODR = 0X0;
        delay(100);
        GPIOG->ODR = (1<<13);
        delay(100);
    }

}
```


D:\coding assn sem6\embedded-assn\lab7\togglingleds.uvprojx - µVision
File Edit View Project Flash Debug Peripherals Tools SVCS Window Help
Target 1
togglelds.c
startup_stm32f407xx.s
system_stm32f4xx.c
Build Output

```
#include "stm32f4xx.h"
void delay(int dd){
  for (int i = 0;i<dd;i++){
    for (int j = 0;j<300000;j++){
      ;
    }
  }
}

main(void)
{

  RCC->AHB1ENR = 0X40; // ENABLING CLOCK FOR PORT G
  GPIOG->MODER = 0X4000000;
  GPIOG->ODR = (1<<13);
  while (1) {
    GPIOG->ODR = 0X0;
    delay(100);
    GPIOG->ODR = (1<<13);
    delay(100);
  }

}
```

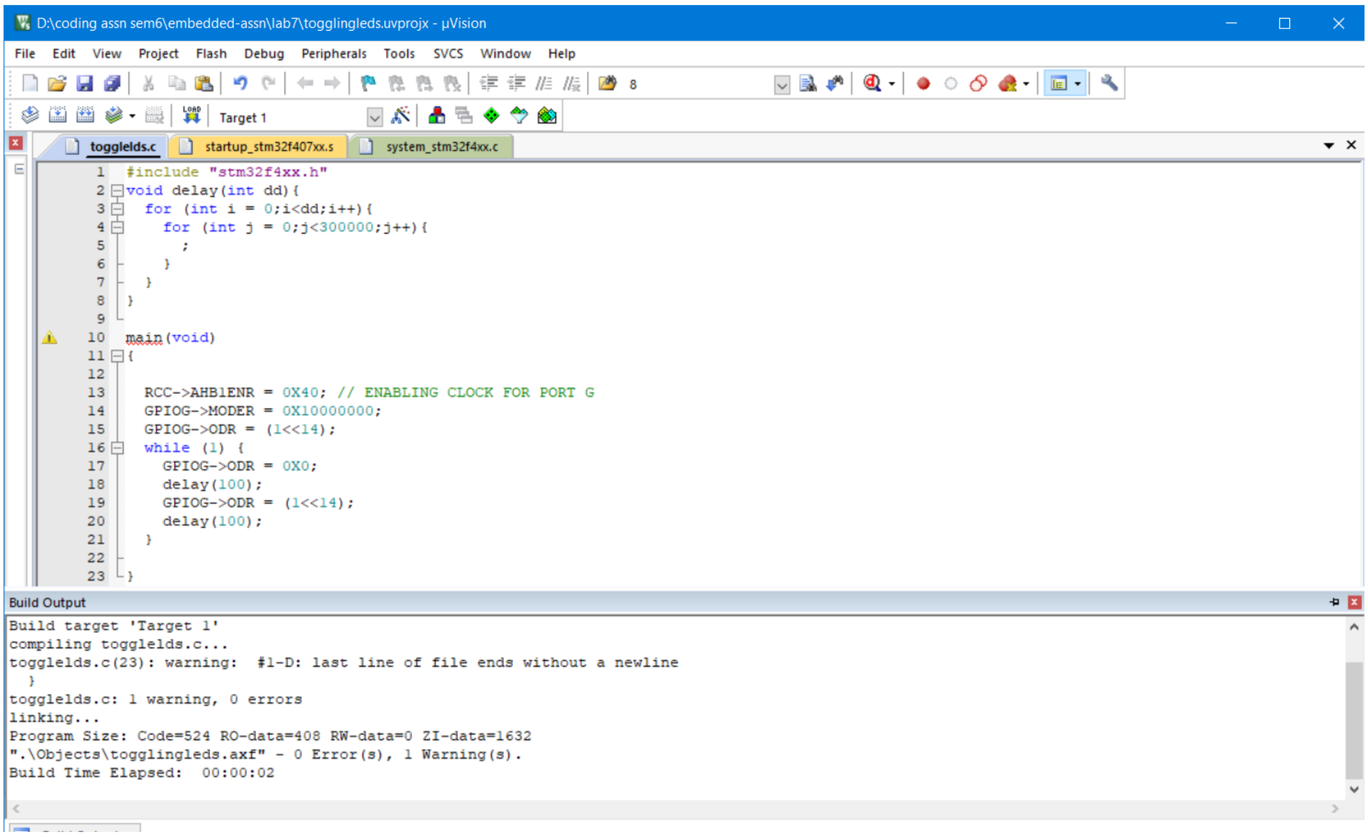
```
Build target 'Target 1'
compiling togglelds.c...
togglelds.c(23): warning:  #1-D: last line of file ends without a newline
  }
togglelds.c: 1 warning, 0 errors
linking...
Program Size: Code=524 RO-data=408 RW-data=0 ZI-data=1632
".\Objects\togglingleds.axf" - 0 Error(s), 1 Warning(s).
Build Time Elapsed:  00:00:02
```

logic

- the logic is same as above, the difference is that only one led ($PG13$) is glowing here and for that moder is set to $0x4000000$

part-b

```
#include "stm32f4xx.h"
void delay(int dd){
    for (int i = 0;i<dd;i++){
        for (int j = 0;j<300000;j++){
            ;
        }
    }
}

main(void)
{

    RCC->AHB1ENR = 0X40; // ENABLING CLOCK FOR PORT G
    GPIOG->MODER = 0X10000000;
    GPIOG->ODR = (1<<14);
    while (1) {
        GPIOG->ODR = 0X0;
        delay(100);
        GPIOG->ODR = (1<<14);
        delay(100);
    }

}
```


D:\coding assn sem6\embedded-assn\lab7\togglingleds.uvprojx - µVision
File Edit View Project Flash Debug Peripherals Tools SVCS Window Help
Target 1
togglelds.c
startup_stm32f407xx.s
system_stm32f4xx.c
Build Output

```
#include "stm32f4xx.h"
void delay(int dd){
  for (int i = 0;i<dd;i++){
    for (int j = 0;j<300000;j++){
      ;
    }
  }
}

main(void)
{

  RCC->AHB1ENR = 0X40; // ENABLING CLOCK FOR PORT G
  GPIOG->MODER = 0X10000000;
  GPIOG->ODR = (1<<14);
  while (1) {
    GPIOG->ODR = 0X0;
    delay(100);
    GPIOG->ODR = (1<<14);
    delay(100);
  }
}
```

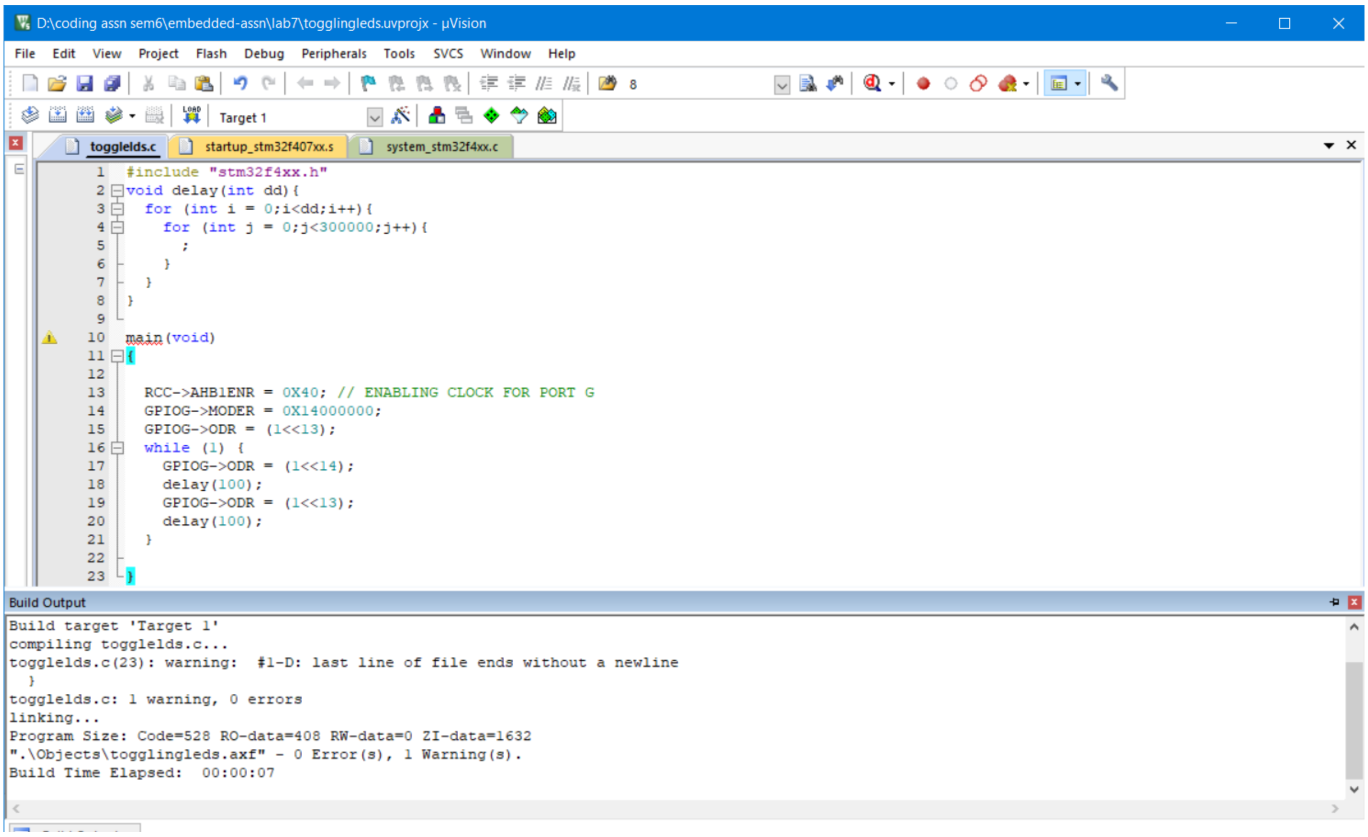
```
Build target 'Target 1'
compiling togglelds.c...
togglelds.c(23): warning:  #1-D: last line of file ends without a newline
  }
togglelds.c: 1 warning, 0 errors
linking...
Program Size: Code=524 RO-data=408 RW-data=0 ZI-data=1632
".\Objects\togglingleds.axf" - 0 Error(s), 1 Warning(s).
Build Time Elapsed:  00:00:02
```

logic

- the logic is same as above, the difference is that only one led ($PG13$) is glowing here and for that moder is set to $0x10000000$

part-c

```
#include "stm32f4xx.h"
void delay(int dd){
    for (int i = 0;i<dd;i++){
        for (int j = 0;j<300000;j++){
            ;
        }
    }
}

main(void)
{

    RCC->AHB1ENR = 0X40; // ENABLING CLOCK FOR PORT G
    GPIOG->MODER = 0X14000000;
    GPIOG->ODR = (1<<13);
    while (1) {
        GPIOG->ODR = (1<<14);
        delay(100);
        GPIOG->ODR = (1<<13);
        delay(100);
    }

}
```


D:\coding assn sem6\embedded-assn\lab7\togglingleds.uvprojx - µVision

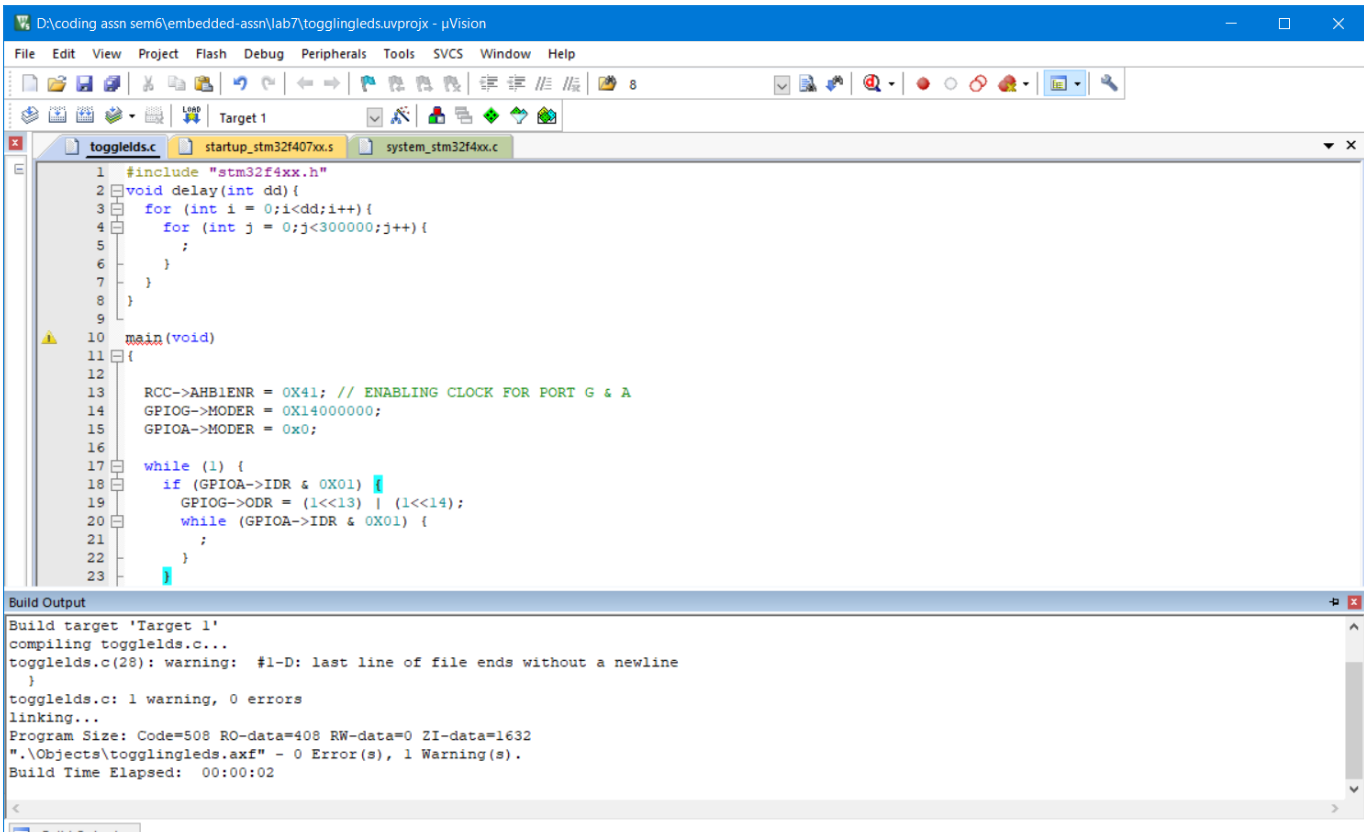
```
Build target 'Target 1'
compiling togglelds.c...
togglelds.c(23): warning:  #1-D: last line of file ends without a newline
  }
togglelds.c: 1 warning, 0 errors
linking...
Program Size: Code=528 RO-data=408 RW-data=0 ZI-data=1632
".\Objects\togglingleds.axf" - 0 Error(s), 1 Warning(s).
Build Time Elapsed:  00:00:07
```

logic

- basic logic is same just the difference is that we are now toggling both led's alternatively.

Task-3

```
#include "stm32f4xx.h"
void delay(int dd){
    for (int i = 0;i<dd;i++){
        for (int j = 0;j<300000;j++){
            ;
        }
    }
}

main(void)
{

    RCC->AHB1ENR = 0X41; // ENABLING CLOCK FOR PORT G & A
    GPIOG->MODER = 0X14000000;
    GPIOA->MODER = 0x0;

    while (1) {
        if (GPIOA->IDR & 0X01) {
            GPIOG->ODR = (1<<13) | (1<<14);
            while (GPIOA->IDR & 0X01) {
                ;
            }
        }
        GPIOA->ODR = 0X0;

    }

}
```


D:\coding assn sem6\embedded-assn\lab7\togglingleds.uvprojx - µVision
File Edit View Project Flash Debug Peripherals Tools SVCS Window Help
Target 1
togglelds.c
startup_stm32f407xx.s
system_stm32f4xx.c
Build Output

```
#include "stm32f4xx.h"
void delay(int dd){
  for (int i = 0;i<dd;i++){
    for (int j = 0;j<300000;j++){
      ;
    }
  }
}

main(void)
{

  RCC->AHB1ENR = 0X41; // ENABLING CLOCK FOR PORT G & A
  GPIOG->MODER = 0X14000000;
  GPIOA->MODER = 0x0;

  while (1) {
    if (GPIOA->IDR & 0X01) {
      GPIOG->ODR = (1<<13) | (1<<14);
      while (GPIOA->IDR & 0X01) {
        ;
      }
    }
```

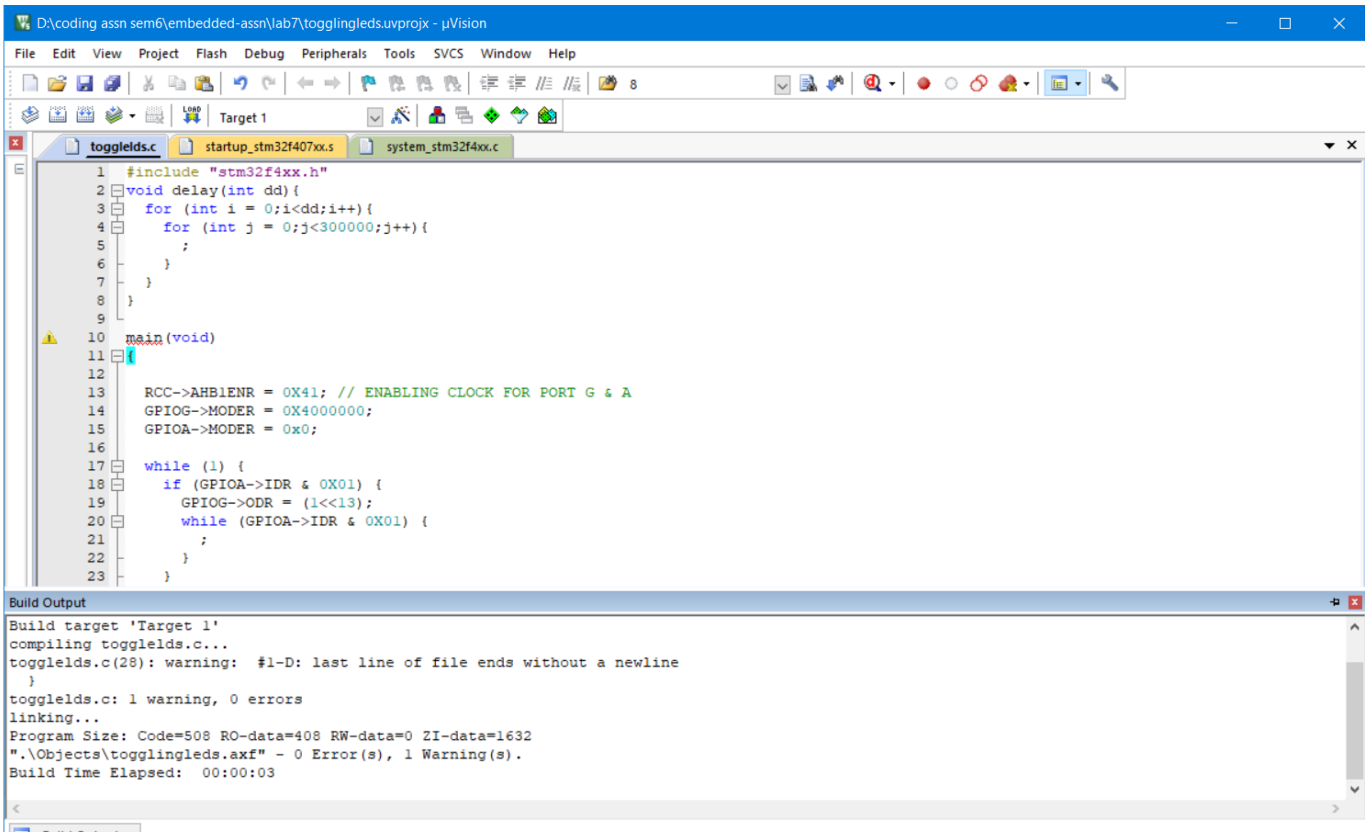
```
Build target 'Target 1'
compiling togglelds.c...
togglelds.c(28): warning:  #1-D: last line of file ends without a newline
  }
togglelds.c: 1 warning, 0 errors
linking...
Program Size: Code=508 RO-data=408 RW-data=0 ZI-data=1632
".\Objects\togglingleds.axf" - 0 Error(s), 1 Warning(s).
Build Time Elapsed:  00:00:02
```

logic

- for internal led's we need to glow when the push button is pressed and push button is at PA0
- set the RCC->AHB1ENR as 0x41 to enable clock for port G,A
- set Moder for G as 0x14000000
- set Moder for A as 0x00 for making it in input mode
- inside while loop we are waiting for GPIOA->IDR to be 1 since it is 1 when we press it.
- and then if it is 1 then light the led and wait till it is pressed
- and then make led off once the butten is not pressed

Task-4

```
#include "stm32f4xx.h"
void delay(int dd){
    for (int i = 0;i<dd;i++){
        for (int j = 0;j<300000;j++){
            ;
        }
    }
}

main(void)
{

    RCC->AHB1ENR = 0X41; // ENABLING CLOCK FOR PORT G & A
    GPIOG->MODER = 0X4000000;
    GPIOA->MODER = 0x0;
    while (1) {
        if (GPIOA->IDR & 0X01) {
            GPIOG->ODR = (1<<13);
            while (GPIOA->IDR & 0X01) {
                ;
            }
        }
        GPIOA->ODR = 0X0;

    }

}
```


D:\coding assn sem6\embedded-assn\lab7\togglingleds.uvprojx - µVision

```
#include "stm32f4xx.h"
void delay(int dd){
  for (int i = 0;i<dd;i++){
    for (int j = 0;j<300000;j++){
      ;
    }
  }
}

main(void)
{

  RCC->AHB1ENR = 0X41; // ENABLING CLOCK FOR PORT G & A
  GPIOG->MODER = 0X4000000;
  GPIOA->MODER = 0x0;

  while (1) {
    if (GPIOA->IDR & 0X01) {
      GPIOG->ODR = (1<<13);
      while (GPIOA->IDR & 0X01) {
        ;
      }
    }
```

Build Output

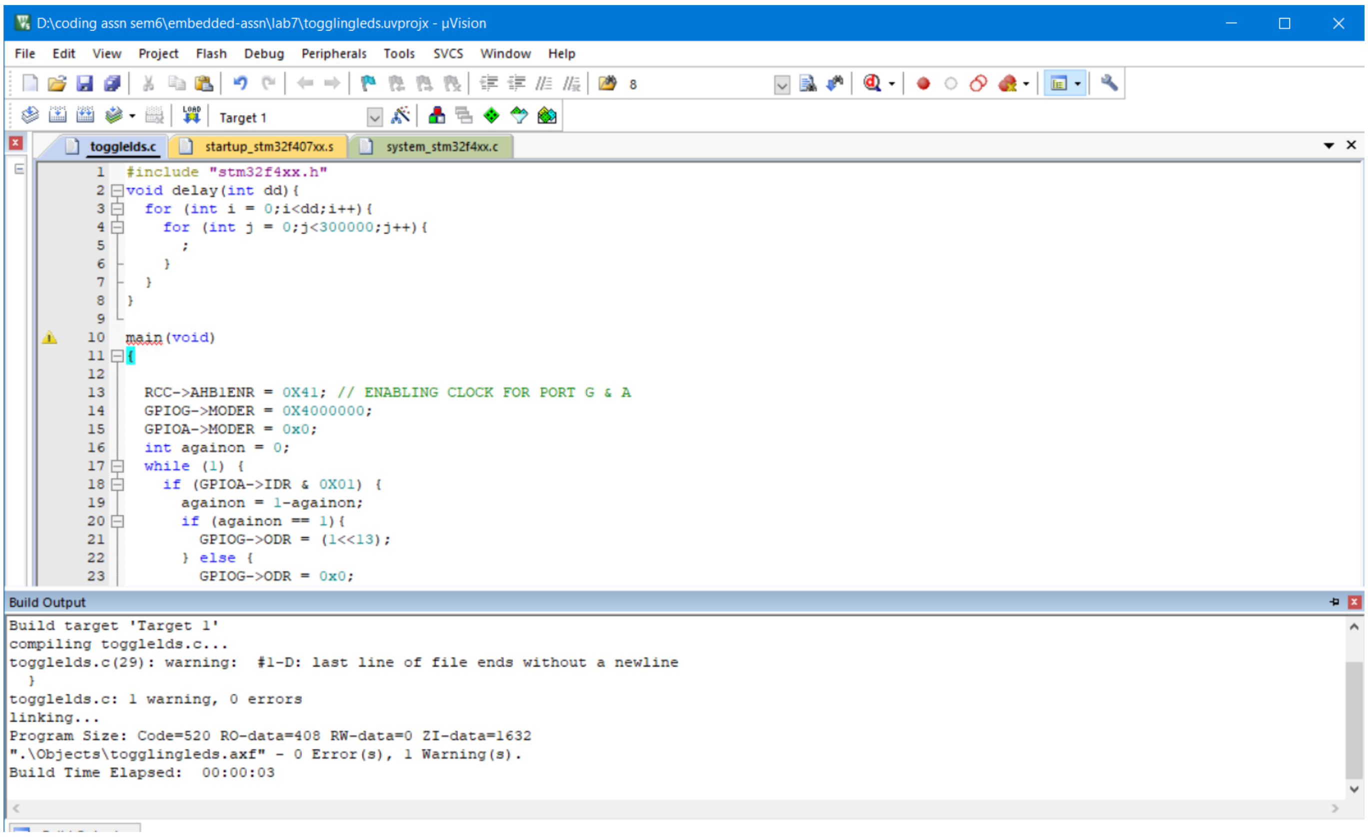
```
Build target 'Target 1'
compiling togglelds.c...
togglelds.c(28): warning:  #1-D: last line of file ends without a newline
  }
togglelds.c: 1 warning, 0 errors
linking...
Program Size: Code=508 RO-data=408 RW-data=0 ZI-data=1632
".\Objects\togglingleds.axf" - 0 Error(s), 1 Warning(s).
Build Time Elapsed:  00:00:03
```

logic

- In this logic we are connecting external led at $PG13$ port and hence logic is to just make that pin high so that 5V voltage is created and light the external led

Task-5

```
#include "stm32f4xx.h"
void delay(int dd){
    for (int i = 0;i<dd;i++){
        for (int j = 0;j<300000;j++){
            ;
        }
    }
}

main(void)
{

    RCC->AHB1ENR = 0X41; // ENABLING CLOCK FOR PORT G & A
    GPIOG->MODER = 0X4000000;
    GPIOA->MODER = 0x0;
    int againon = 0;
    while (1) {
        if (GPIOA->IDR & 0X01) {
            againon = 1-againon;
            if (againon == 1){
                GPIOG->ODR = (1<<13);
            } else {
                GPIOG->ODR = 0x0;
            }
            while (GPIOA->IDR & 0X01);
        }
    }

}
```


D:\coding assn sem6\embedded-assn\lab7\togglingleds.uvprojx - µVision
File Edit View Project Flash Debug Peripherals Tools SVCS Window Help
Target 1
togglelds.c
startup_stm32f407xx.s
system_stm32f4xx.c
Build Output

```
#include "stm32f4xx.h"
void delay(int dd){
  for (int i = 0;i<dd;i++){
    for (int j = 0;j<300000;j++){
      ;
    }
  }
}

main(void)
{

  RCC->AHB1ENR = 0X41; // ENABLING CLOCK FOR PORT G & A
  GPIOG->MODER = 0X4000000;
  GPIOA->MODER = 0x0;
  int againon = 0;
  while (1) {
    if (GPIOA->IDR & 0X01) {
      againon = 1-againon;
      if (againon == 1){
        GPIOG->ODR = (1<<13);
      } else {
        GPIOG->ODR = 0x0;
```

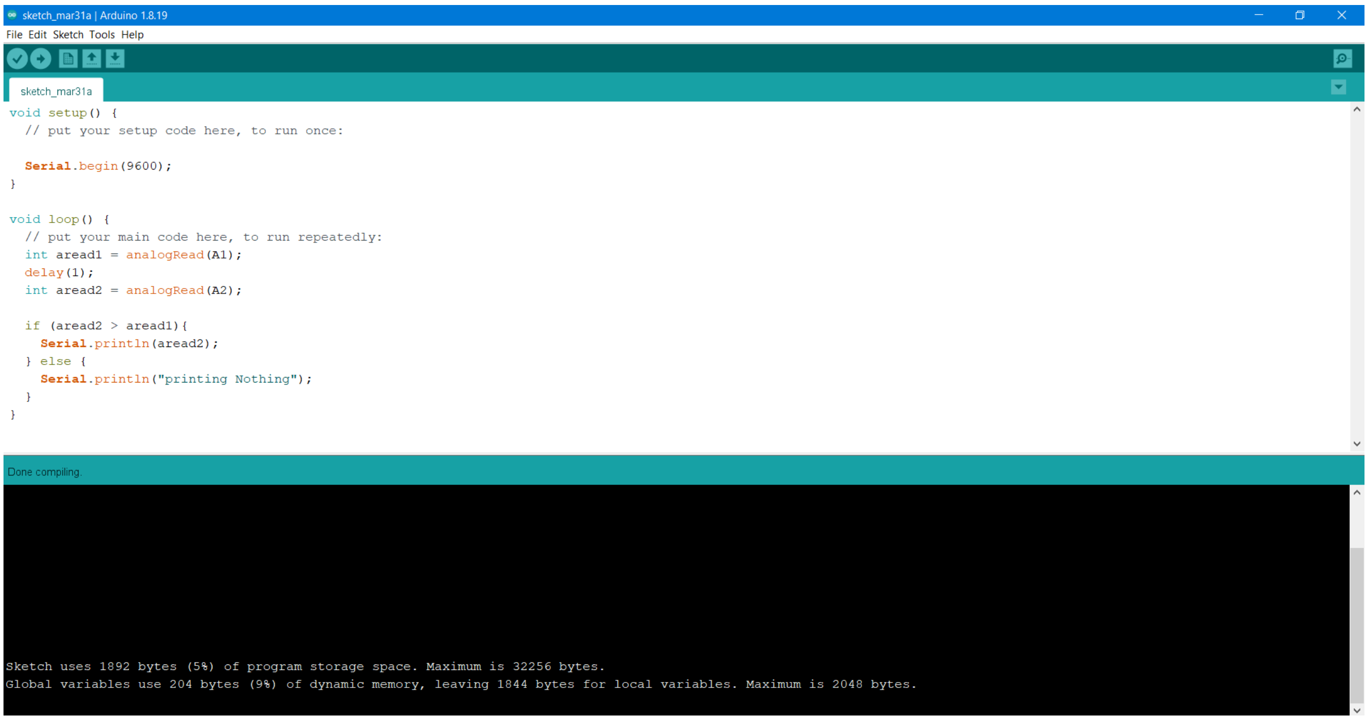
```
Build target 'Target 1'
compiling togglelds.c...
togglelds.c(29): warning:  #1-D: last line of file ends without a newline
  }
togglelds.c: 1 warning, 0 errors
linking...
Program Size: Code=520 RO-data=408 RW-data=0 ZI-data=1632
".\Objects\togglingleds.axf" - 0 Error(s), 1 Warning(s).
Build Time Elapsed:  00:00:03
```

logic

- in this the external led is connected at $PG13$ only but we are toggling it by pressing button

Task-6

```
void setup() {
  // put your setup code here, to run once:

  Serial.begin(9600);
}

void loop() {
  // put your main code here, to run repeatedly:
  int aread1 = analogRead(A1);
  delay(1);
  int aread2 = analogRead(A2);

  if (aread2 > aread1){
    Serial.println(aread2);
  } else {
    Serial.println("printing Nothing");
  }
}
```



```
void setup() {
  // put your setup code here, to run once:

  Serial.begin(9600);
}

void loop() {
  // put your main code here, to run repeatedly:
  int aread1 = analogRead(A1);
  delay(1);
  int aread2 = analogRead(A2);

  if (aread2 > aread1){
    Serial.println(aread2);
  } else {
    Serial.println("printing Nothing");
  }
}
```

```
Sketch uses 1892 bytes (5%) of program storage space. Maximum is 32256 bytes.
Global variables use 204 bytes (9%) of dynamic memory, leaving 1844 bytes for local variables. Maximum is 2048 bytes.
```

logic

- logic is that read two values from analog A1 and A2 and check if $(a_2 > a_1)$ if it is true then print value read from analog 2
