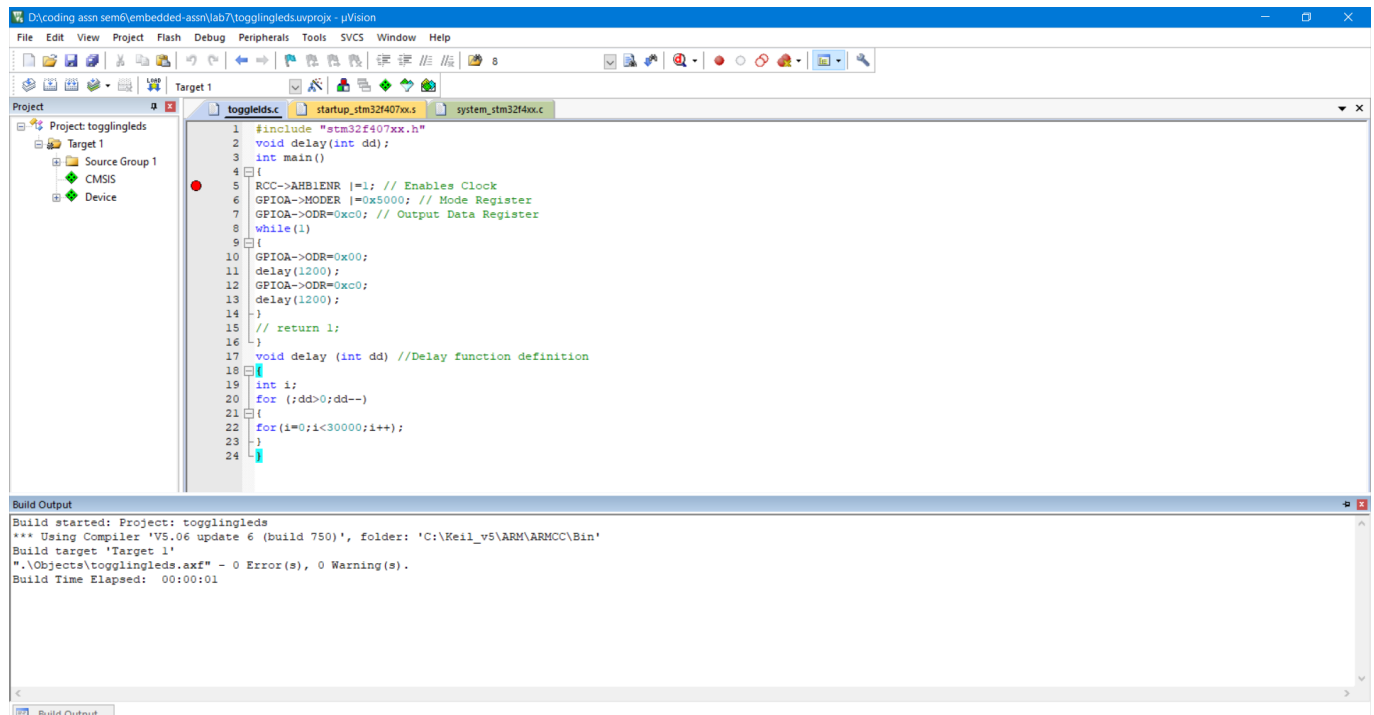


Nirbhay Sharma (B19CSE114)

DSL - Lab - 7

Simulation Of Programs

part1

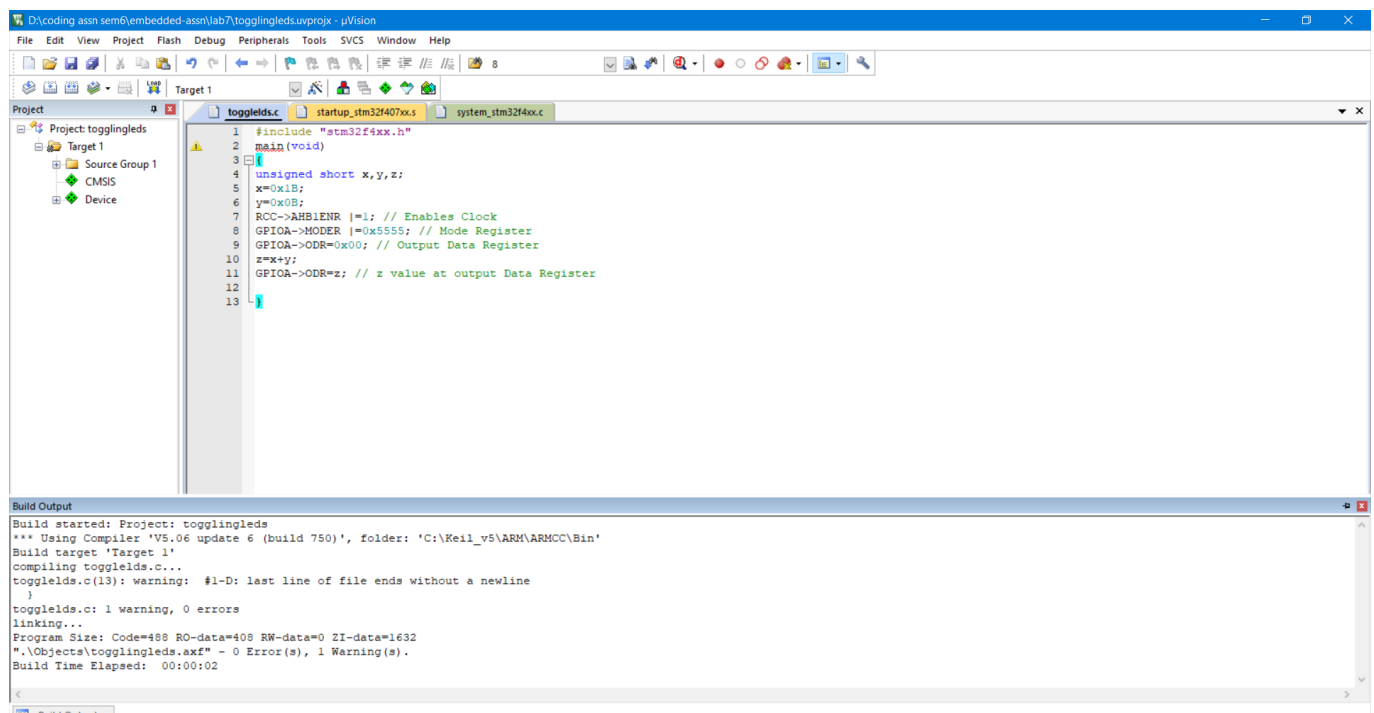


```
1 #include "stm32f407xx.h"
2 void delay(int dd);
3 int main()
4 {
5     RCC->AHB1ENR |=1; // Enables Clock
6     GPIOA->MODER |=0x5000; // Mode Register
7     GPIOA->ODR=0xc0; // Output Data Register
8     while(1)
9     {
10        GPIOA->ODR=0x00;
11        delay(1200);
12        GPIOA->ODR=0xc0;
13        delay(1200);
14    }
15    // return 1;
16 }
17 void delay (int dd) //Delay function definition
18 {
19     int i;
20     for (;dd>0;dd--)
21     {
22         for(i=0;i<30000;i++);
23     }
24 }
```

Build Output

Build started: Project: togglingleds
*** Using Compiler 'VS.06 update 6 (build 750)', folder: 'C:\Keil_v5\ARM\ARMCC\Bin'
Build target 'Target 1'
".\Objects\togglingleds.axf" - 0 Error(s), 0 Warning(s).
Build Time Elapsed: 00:00:01

part2

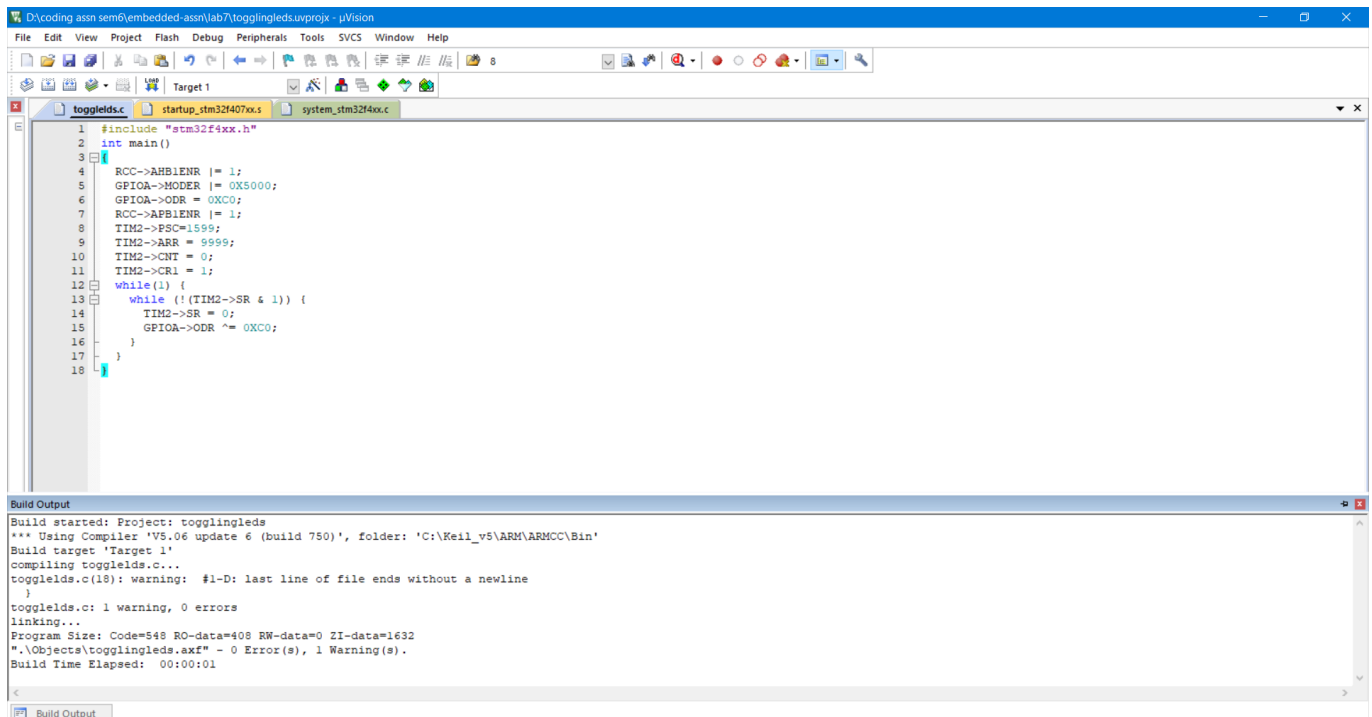


```
1 #include "stm32f4xx.h"
2 main(void)
3 {
4     unsigned short x,y,z;
5     x=0x1B;
6     y=0x0B;
7     RCC->AHB1ENR |=1; // Enables Clock
8     GPIOA->MODER |=0x5555; // Mode Register
9     GPIOA->ODR=0x00; // Output Data Register
10    z=x+y;
11    GPIOA->ODR=z; // z value at output Data Register
12 }
13
```

Build Output

Build started: Project: togglingleds
*** Using Compiler 'VS.06 update 6 (build 750)', folder: 'C:\Keil_v5\ARM\ARMCC\Bin'
Build target 'Target 1'
compiling togglingleds.c...
togglingleds.c(13): warning: #1-D: last line of file ends without a newline
togglingleds.c: 1 warning, 0 errors
linking...
Program Size: Code=488 RO-data=408 RW-data=0 ZI-data=1632
".\Objects\togglingleds.axf" - 0 Error(s), 1 Warning(s).
Build Time Elapsed: 00:00:02

part3



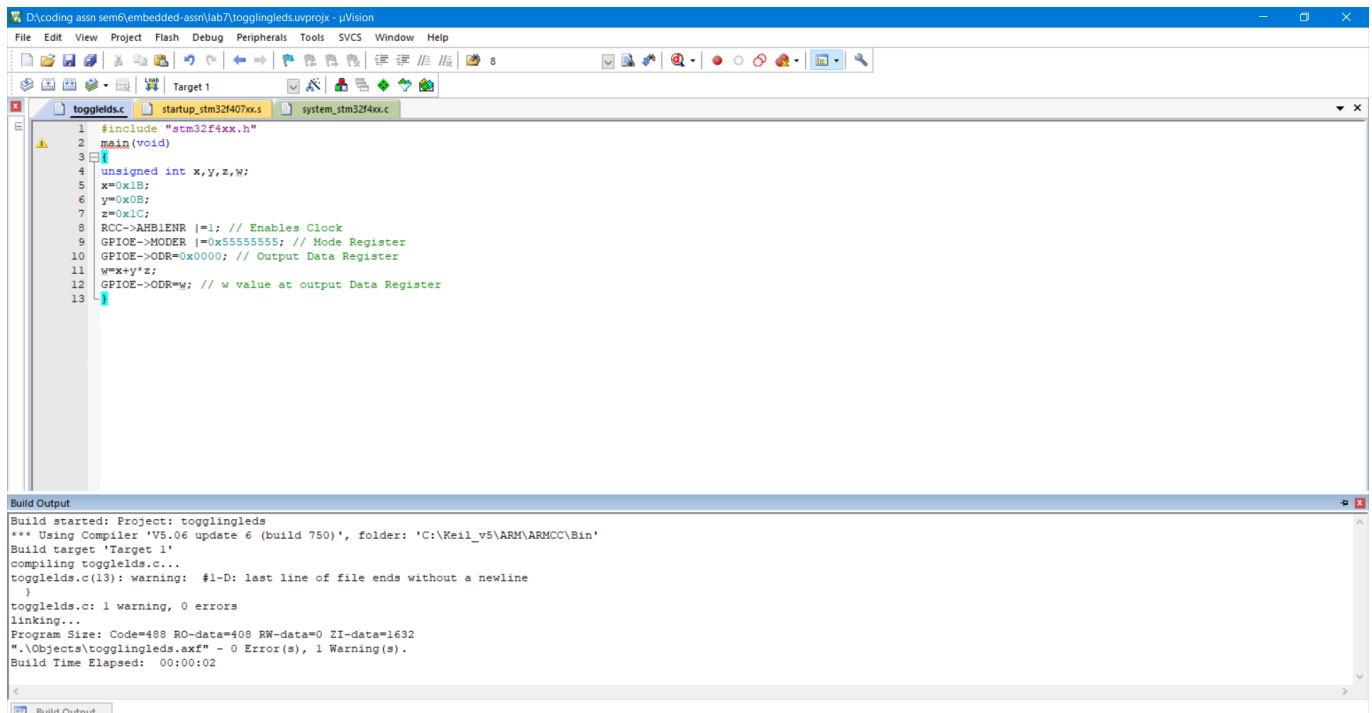
1. if we expand 0xc0 then it comes out to be 11000000, observe that 6th and 7th pin is high, it means that we are enabling pin 6 and pin 7, as required
2. if we expand 0x5000 then it comes out to be (01 01 00 00 00 00 00 00), each of them represents 2 bits and notice that 6th and 7th pin is set to 01, which means that they are getting high for output mode
3. if we change 30000 to 50000 then delay(1200) would be more for same value (1200), which means that led's will blink after more dealy
4. yes, there is one typo in the program i.e GPIOB->ODR = Z, because we want output to be at GPIOA and not GPIOB
5. Since, x and y both are of 8 bits and so z would be of 8 bits so we need 8 output moder pins to display the output of led's so we set it to 0x5555 (01 01 01 01 01 01 01 01) it directly means that 8 pins are set to output mode (01) to display ouput of led's
6. code is presented below

```

#include "stm32f4xx.h"
main(void)
{
    unsigned int x,y,z,w;
    x=0x1B;
    y=0x0B;
    z=0x1C;
    RCC->AHB1ENR |=1; // Enables Clock
    GPIOE->MODER |=0x55555555; // Mode Register
    GPIOE->ODR=0x0000; // Output Data Register
    w=x+y*z;
    GPIOE->ODR=w; // w value at output Data Register
}

```

- logic for code is that since there are 3, 8 bit integers so we want 16 bit output so all the 16 bits of odr needs to be initialized with 0 and all 32 bit of modcr register is to be set to 01 (GPIO output mode) so it is set to 0x55555555 now we calculate the value of w ($x + y * z$) and assign it to odr to get the output on all the 16 bits. and since we need to give output at port E, thats why GPIOE is used.
- build output for the code is shown below:-



The screenshot shows the uVision IDE with a project named 'togglingleds'. The main window displays the code for 'togglingleds.c', which includes the 'stm32f4xx.h' header and defines a 'main' function. The code initializes variables x, y, and z, enables the clock for GPIOE, sets the mode register to 0x55555555, and calculates the value of w as x + y * z. The build output window at the bottom shows the compilation process, including warnings and the final program size.

```

1 #include "stm32f4xx.h"
2 main(void)
3 {
4     unsigned int x,y,z,w;
5     x=0x1B;
6     y=0x0B;
7     z=0x1C;
8     RCC->AHB1ENR |=1; // Enables Clock
9     GPIOE->MODER |=0x55555555; // Mode Register
10    GPIOE->ODR=0x0000; // Output Data Register
11    w=x+y*z;
12    GPIOE->ODR=w; // w value at output Data Register
13 }

```

Build Output

```

Build started: Project: togglingleds
*** Using Compiler 'VS.06 update 6 (build 750)', folder: 'C:\Weil_v5\ARM\ARMCC\Bin'
Build target 'Target 1'
compiling togglingleds.c...
togglingleds.c(13): warning: #1-D: last line of file ends without a newline
}
togglingleds.c: 1 warning, 0 errors
linking...
Program Size: Code=488 RO-data=408 RW-data=0 ZI-data=1632
*.\\Objects\\togglingleds.axf" - 0 Error(s), 1 Warning(s).
Build Time Elapsed: 00:00:02

```

7. the prescalar value is chosen in such a manner that output clock frequency satisfies a particular equation i.e.

$$f_{ckcnt} = \frac{f_{cLpsc}}{psc + 1}$$

so psc is choose to be 1599 so that f_{ckcnt} which is ouput frequency is a particular value that we want so we divide f_{cLpsc} by (1599 + 1) i.e. 1600

8. Since we have a delay of $1s \simeq 1000ms$ and though ARR value is delay - 1 so arr = 1000 - 1 = 999 and not 9999