CPE301 – SPRING 2019

Design Assignment 1B

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Primary Github address: https://github.com/yeeun219/submission\_da.git

Directory: cpe301\DesignAssignments\DA1B

1. **COMPONENTS LIST AND CONNECTION BLOCK DIAGRAM w/ PINS**

FILL\_UP ;store at STARTDDS using poiter

SEPERATE\_DIVISION: ;separate data by divisibe 3

ADD\_X: ;sum of the data divisibe 3

ADD\_Y: ;sum of the data not divisibe 3

1. **DEVELOPED CODE OF TASK 1**

;

; AssemblerApplication9.asm

;

; Created: 2019-02-23 오전 8:17:45

; Author : llje2

;

.ORG 0

LDI ZL, LOW($200) ;pointer of STARTDDS

LDI ZH, HIGH($200)

LDI XL, LOW($400) ; x pointer that point value storing divisible by 3

LDI XH, HIGH($400)

LDI YL, LOW($600) ; y pointer that point value storing not divisible by 3

LDI YH, HIGH($600)

LDI R20, 12 ; initial value of STARTDDS, increasing by 1

LDI R24, 99 ; counter of fill\_up loop

FILL\_UP: INC R20

ST Z+,R20 ;store at STARTDDS using poiter

DEC R24

BREQ SEPERATE\_DIVISION ;go SEPERATE\_DIVISION to do seperate

RJMP FILL\_UP ; fill up of 99times

1. **DEVELOPED CODE OF TASK 2 from TASK 1**

SEPERATE\_DIVISION: DEC ZL ;decreasing z pointer

LDI R24, 99 ; counter of seperate

SEPERATE: LD R20, Z;load from RAM, r20 store of the rest

MOV R25, R20 ;r25 is the temporary value of loaded value that are used to store in RAM of x pointer

DEC ZL ;decreasing z pointer and load 1 data from ram

.DEF NUM = R23

MOV NUM, R20;the value of dividend

.DEF DENOMINATOR =R21

.DEF QUOTIENT = R22

LDI QUOTIENT,0

LDI DENOMINATOR, 3

L1: INC QUOTIENT ;Subtract until zero or negative, Increasing by one QUOTIENT for each subtraction

SUB NUM, DENOMINATOR

BRCC L1

DEC QUOTIENT ;because of one more time adding

MUL QUOTIENT,DENOMINATOR ; the rest is the value of dividend - QUOTIENT\*DENOMINATOR(r0)

SUB R20, R0 ;store the rest in r20

BRNE Y\_STORE ;if the value of r20 is not 0(not divisible by 3), then go Y\_STORE

X\_STORE: ST X+, R25 ; else go X\_STORE

JMP NEXT

Y\_STORE: ST Y+, R25

NEXT: DEC R24

BREQ ADD\_X

RJMP SEPERATE

1. **DEVELOPED CODE OF TASK 3 from TASK 2**

ADD\_X: LDI R24, 40;counter of add\_x\_loop

LDI R21,0 ; initialize the upper value of r 20

ADD\_X\_LOOP: DEC XL

LD R20, X ;load the data of pointer x

ADD R16, R20 ;add considering carry overflow

ADC R17,R21

DEC R24

BREQ ADD\_Y

RJMP ADD\_X\_LOOP

ADD\_Y: LDI R24, 90;counter of add\_y\_loop

LDI R21,0 ; initialize the upper value of r 20

ADD\_Y\_LOOP: DEC YL

LD R20, Y ;load the data of pointer y

ADD R18, R20; add considering carry overflow

ADC R19,R21

DEC R24

BREQ END

RJMP ADD\_Y\_LOOP

END: RJMP END

1. **The code of verifying my algorithm using c program TASK4**

#include <iostream>

#include <stdio.h>

int main() {

int total\_sum = 0;

int temp = 13;

for (int i = 1; i <= 99; i++) {

total\_sum = total\_sum + temp; //sum of the 13~111

temp++;

}

int temp\_2 = 15; //sum of the value pointing pointer x

int total\_div = 0;

for (int j = 0; j < 33; j++) {

total\_div += temp\_2;

temp\_2 = temp\_2 + 3;

}

printf("total sum(hex value) of divisible 3 (x pointer) :0x%X \n", total\_div);

printf("total sum(hex value) of not divisible 3 (y pointer) :0x%X", total\_sum-total\_div);

// sum of the value pointing pointer y = sum of the 13~111 - sum of the value pointing pointer x

}

**Result**



**The same value 0x081F(R17:R16), 0x0FDB(R19:R18) with assembly code**

1. **THE EXECUTION TIME TASK5**

Initialize: 9cycle

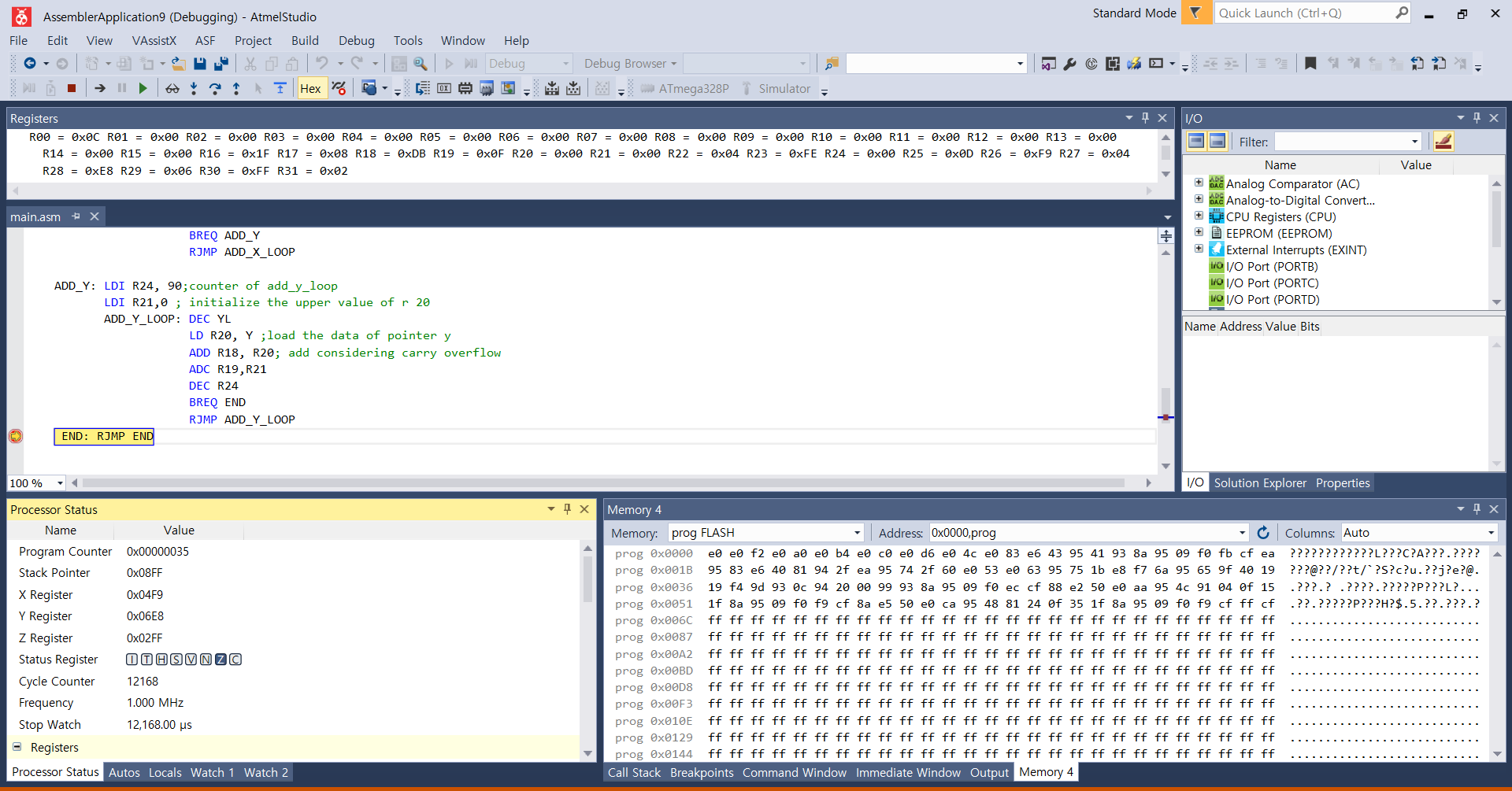
FILL\_UP : 5\*99cycle

SEPERATE\_DIVISION: 2+99\*(9+3\*15(average value +8) cycle

ADD\_X: ; 2+7\*40cycle

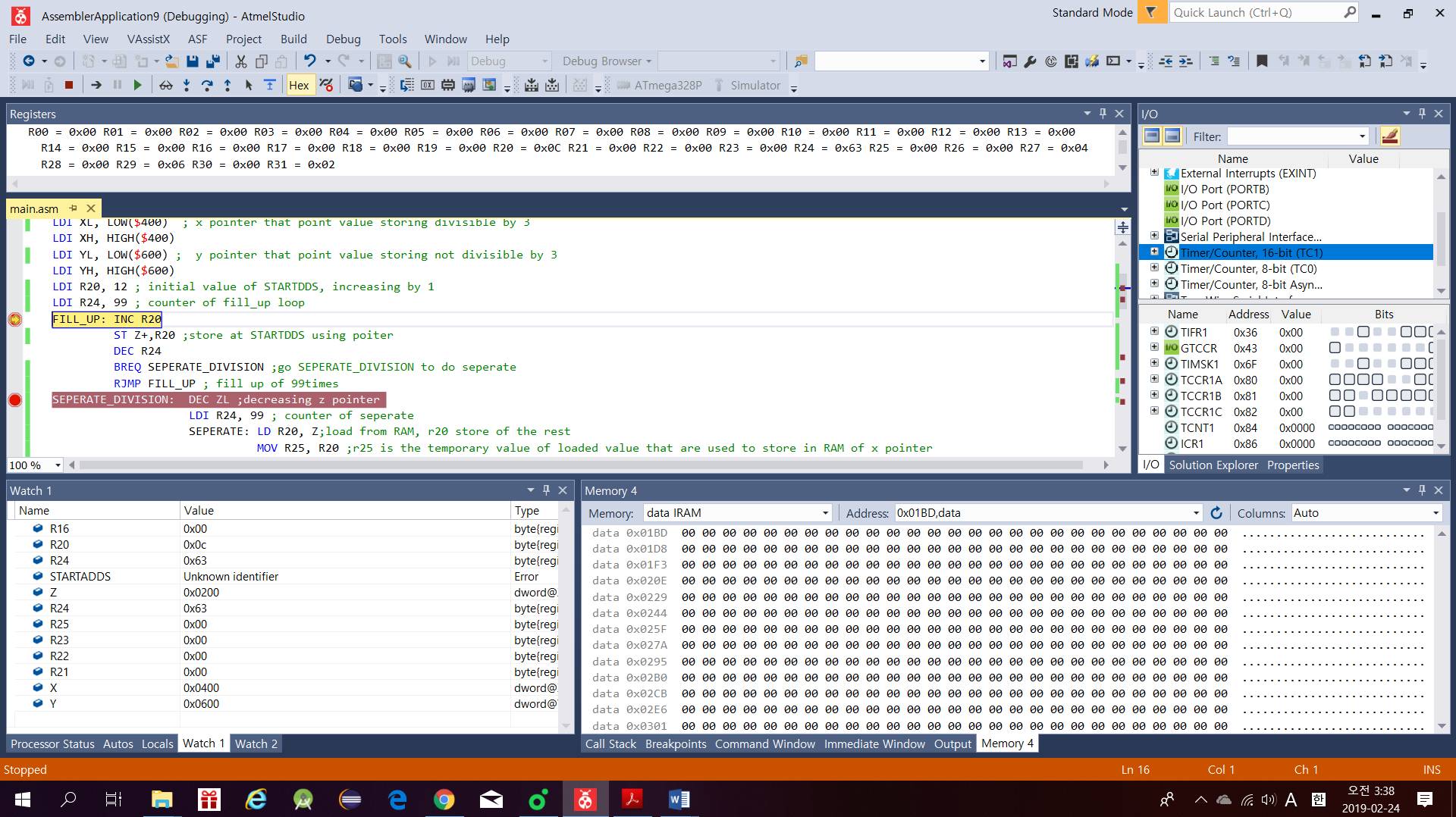
ADD\_Y: 2+7\*90cycle

**Total 75580 cycle**

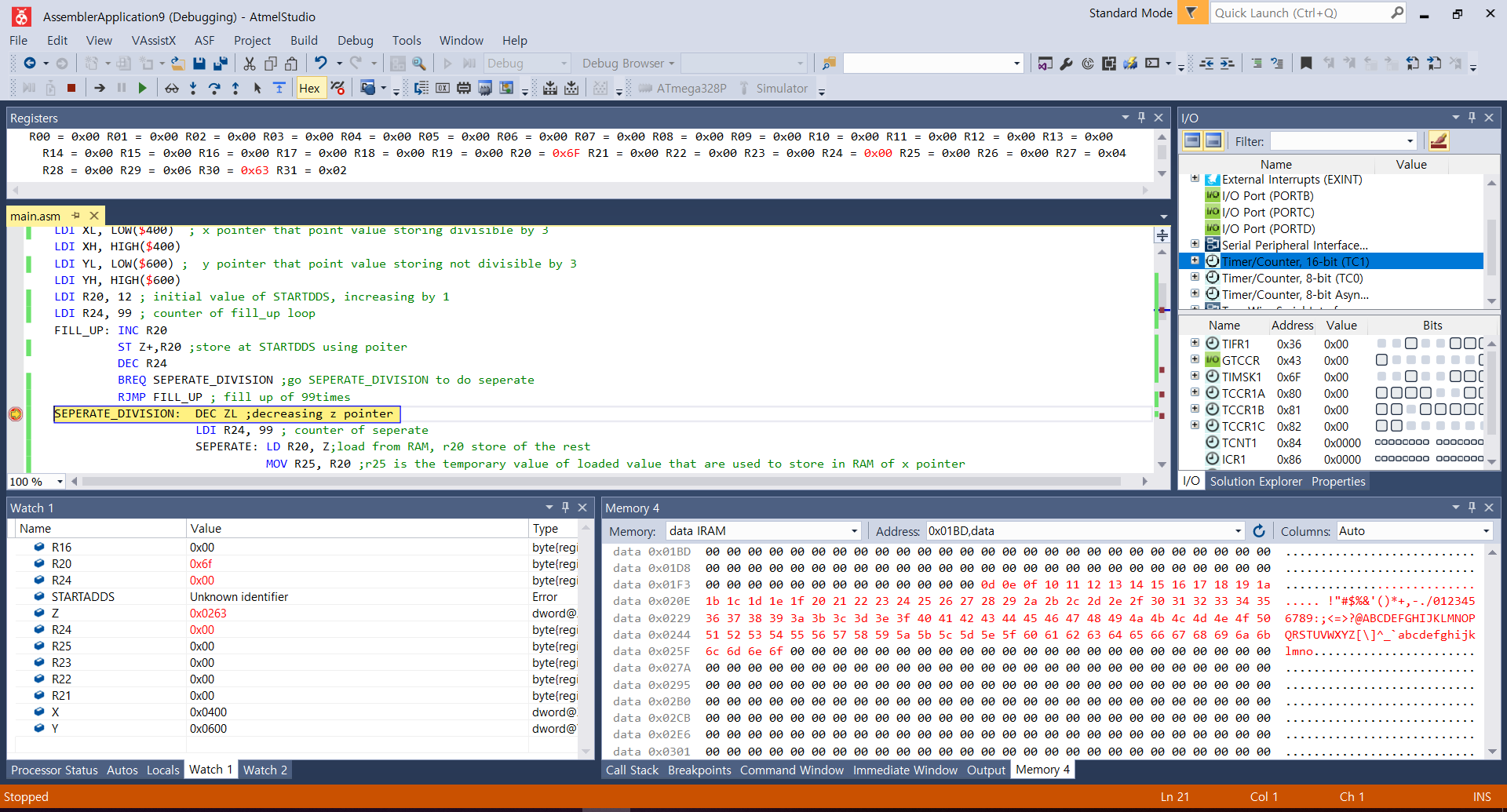


1. **SCREENSHOTS OF EACH TASK OUTPUT (ATMEL STUDIO OUTPUT)**

## The beginning of Task 1 snapshot

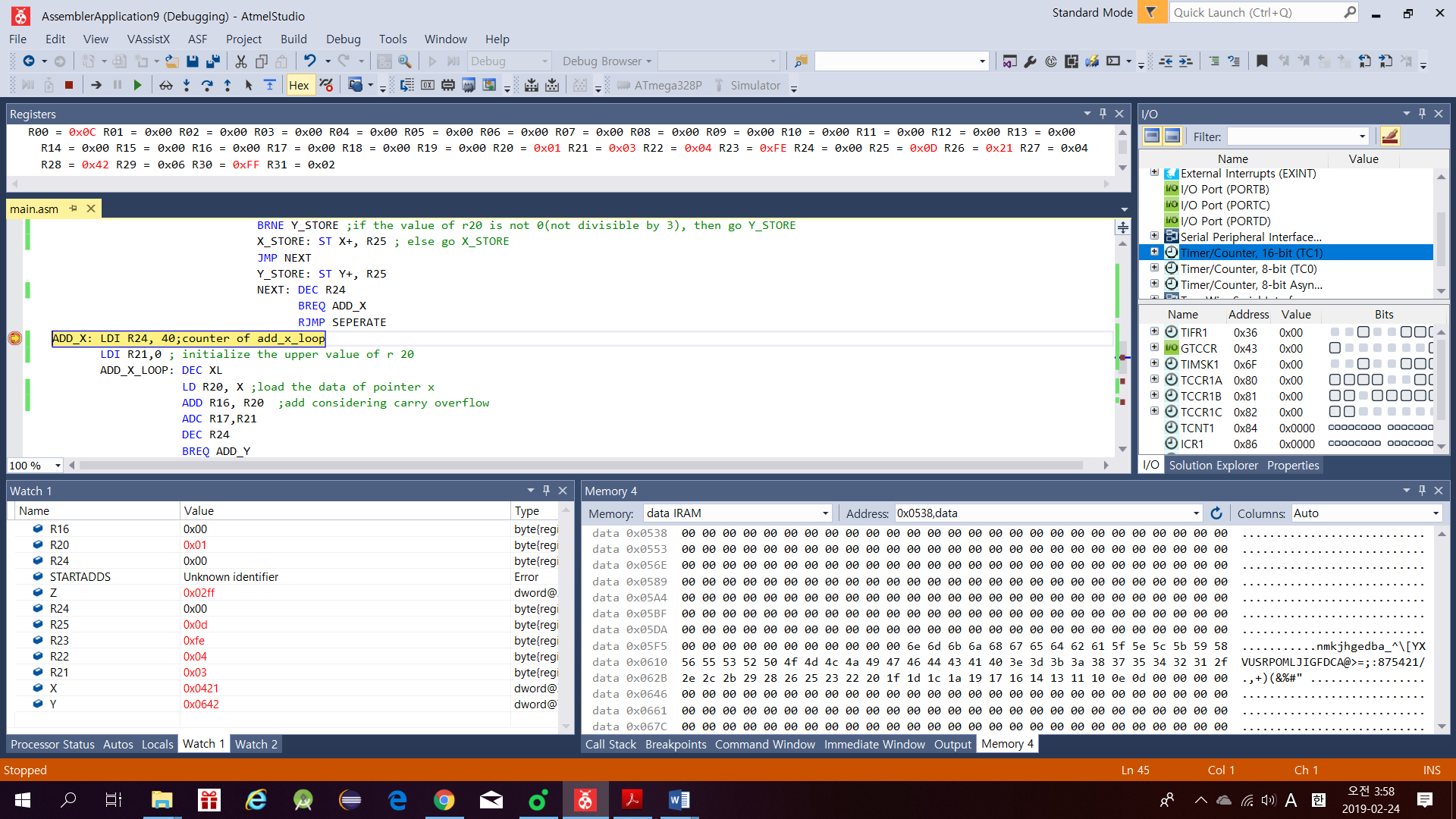


## The end of Task 1 snapshot

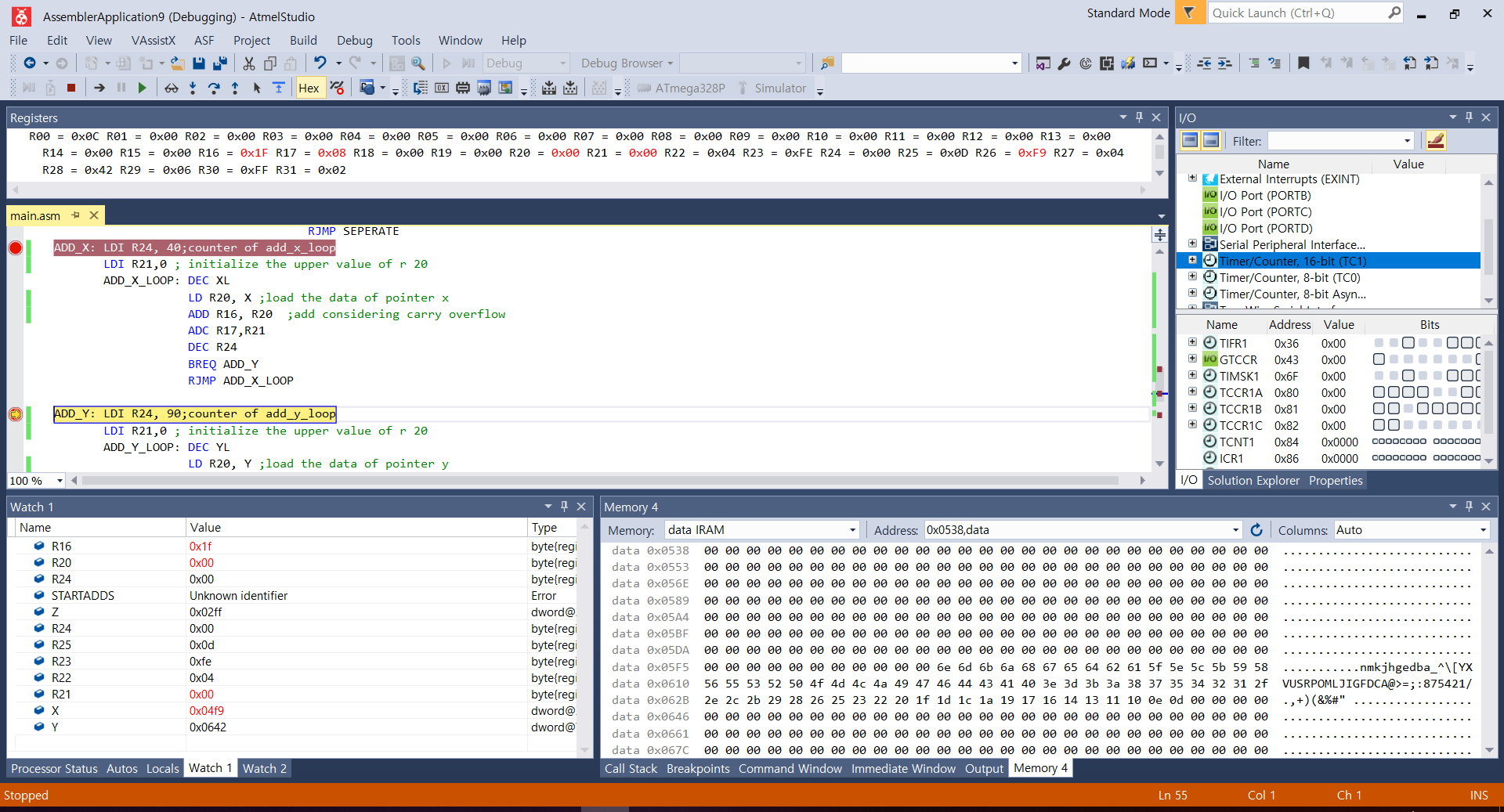


## The end of Task 2 snapshot\_1

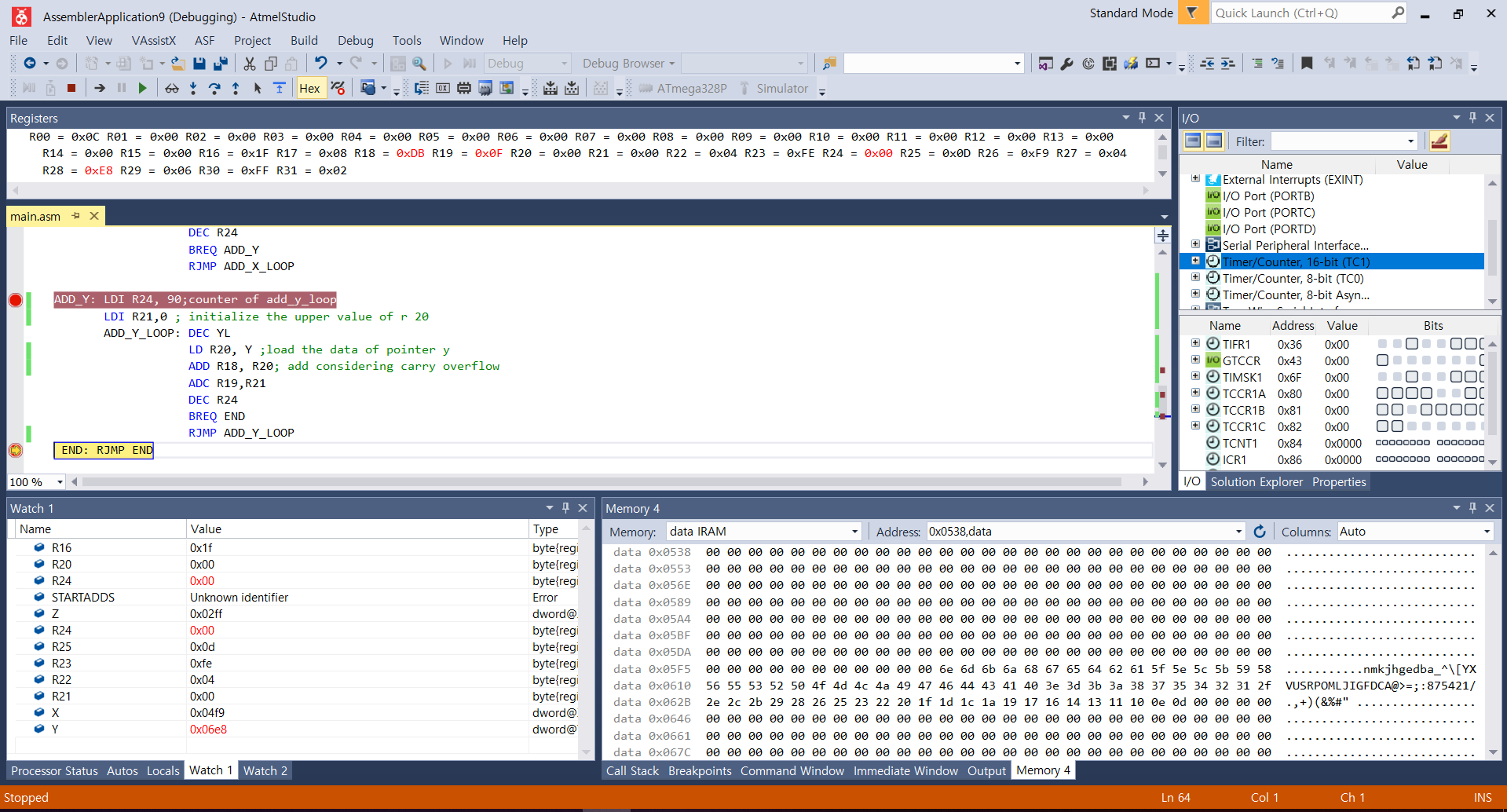
## The end of Task 2 snapshot\_2



## The END of Task 3 snapshot\_1



## The end of Task 3 snapshot \_2



1. **VIDEO LINKS OF EACH DEMO**

<https://youtu.be/nIRHM2ILrIs>

1. **GITHUB LINK OF THIS DA**

Primary Github address: https://github.com/yeeun219/submission\_da.git

Directory: cpe301\DesignAssignments\DA1B

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<http://studentconduct.unlv.edu/misconduct/policy.html>

“This assignment submission is my own, original work”.

Yeeunlee