Republic of the Philippines
CAMARINES SUR POLYTECHNIC COLLEGES
Nabua, Camarines Sur

COLLEGE *of* COMPUTER STUDIES

CS 318 – Architecture and Organization

FINAL PROJECT/EXAM (COMPUTER PROGRAM PROJECT)

GROUP NO: 12 SECTION: BSCS 3A

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ABSTRACT : Volume Converter

This project aims to create a volume converter using NASM assembly language, implementing modular programming, error handling, and input validation. The converter will facilitate conversions between liters, cubic feet, cubic inches, and cubic meters, providing users with a versatile tool for accurately converting volumes.

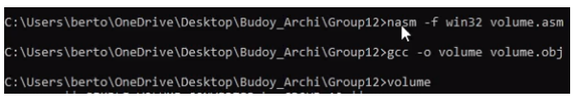
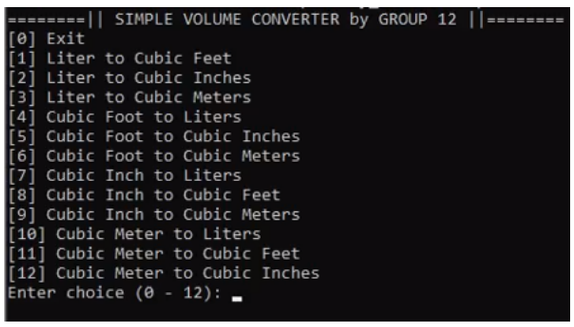
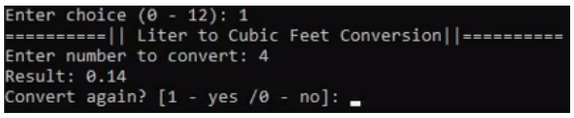
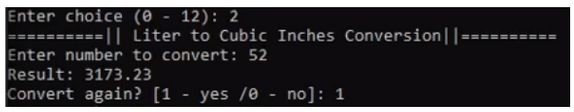
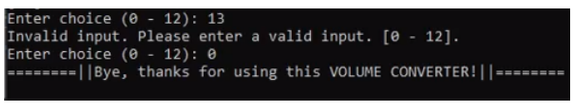
The converter will be developed following the principles of modular programming, dividing the code into separate modules or functions to enhance reusability, maintainability, and readability. The implementation will include error handling and input validation mechanisms to ensure a user-friendly experience. It will address various errors, such as invalid input, negative values, and invalid conversion options. Proper error messages will be displayed to guide users and prompt valid input.The volume converter will feature a menu-based interface, allowing users to enter the value to be converted and select the desired conversion option from a list. Input validation will ensure that only positive numeric values are accepted, and the chosen conversion option will be validated to fall within the valid range.

Overall, this project will deliver an efficient and user-friendly volume converter implemented in NASM assembly language. It will incorporate modular programming, error handling, and input validation to ensure accurate conversions while providing flexibility for future enhancements.

SAMPLE RUN

Step-by-step sample run of your assembly program with explanation.

YouTube link/s: *https://youtu.be/q2A97ToFkPc*

Step1 As usual, Assemble the **"volume.asm"** assembly language source code using the NASM assembler with the target output format set to win32. Next the GCC compiler… compile and link an object file named **"volume.obj"** to get an executable program named ***volume***.	
Step2 Now it displayed the title message, along with the menu choices.	
Step3 Now, the user chose to convert number 1. liter to cubic feet, and then put a number **4** that is going to be converted, and we've got the result **0.14.** and then ask if the user wants to convert again by typing **1** for yes, and **0** for no.	
Step4 Actually, it's the same process as the rest of the list. The only difference is the result that will be shown when the user types a number to be converted.	
Step5 In this part, it displays an error message. Since the user typed a number that is not in the menu choice, the program displayed the error message ***'Invalid input. Please enter a valid input. [0 - 12].'***. then to exit the program just type **"0"** in the menu to exit, then the Thank you message will be displayed.	

PROGRAM CODE

```
;SIMPLE VOLUME CONVERTER by GROUP 12
;CS 318 Architecture and Organization 23-1
;Final Project (Computer Program Project)

; Section containing data, including menu messages, conversion
constants, and prompts
section .data
    menu_msg db '========|| SIMPLE VOLUME CONVERTER by GROUP 12
||========', 0xA
           db '[0] Exit', 0xA
           db '[1] Liter to Cubic Feet', 0xA
           db '[2] Liter to Cubic Inches', 0xA
           db '[3] Liter to Cubic Meters', 0xA
           db '[4] Cubic Foot to Liters', 0xA
           db '[5] Cubic Foot to Cubic Inches', 0xA
           db '[6] Cubic Foot to Cubic Meters', 0xA
           db '[7] Cubic Inch to Liters', 0xA
           db '[8] Cubic Inch to Cubic Feet', 0xA
           db '[9] Cubic Inch to Cubic Meters', 0xA
           db '[10] Cubic Meter to Liters', 0xA
           db '[11] Cubic Meter to Cubic Feet', 0xA
           db '[12] Cubic Meter to Cubic Inches', 10, 0
    menuChoice db 'Enter choice (0 - 12): ', 0, 0
    userInputChoice db '%d', 0
    literToCubicFeetPrompt db '==========|| Liter to Cubic Feet
Conversion||==========', 10, 0
    literToCubicInchesPrompt db '==========|| Liter to Cubic Inches
Conversion||==========', 10, 0
    literToCubicMetersPrompt db '==========|| Liter to Cubic Meters
Conversion||==========', 10, 0
    cubicFootToLitersPrompt db '==========|| Cubic Foot to Liters
Conversion||==========', 10, 0
```

```
    cubicFootToCubicInchesPrompt db '==========|| Cubic Foot to Cubic
Inches Conversion||==========', 10, 0
    cubicFootToCubicMetersPrompt db '==========|| Cubic Foot to Cubic
Meters Conversion||==========', 10, 0
    cubicInchToLitersPrompt db '==========|| Cubic Inch to Liters
Conversion ||==========', 10, 0
    cubicInchToCubicFeetPrompt db '==========|| Cubic Inch to Cubic
Feet Conversion ||==========', 10, 0
    cubicInchToCubicMetersPrompt db '==========|| Cubic Inch to Cubic
Meters Conversion ||==========+', 10, 0
    cubicMeterToLitersPrompt db '==========|| Cubic Meter to Liters
Conversion ||==========', 10, 0
    cubicMeterToCubicFeetPrompt db '==========|| Cubic Meter to Cubic
Feet Conversion ||==========', 10, 0
    cubicMeterToCubicInchesPrompt db '==========|| Cubic Meter to
Cubic Inches Conversion ||==========', 10, 0
    userNumber db 'Enter number to convert: ', 0, 0
    userInputNumber dq '%lf', 0
    resultForGeneral dq 'Result: %0.2lf', 10, 0
    newLine db '', 10, 0
    thanks db '========||Bye, thanks for using this VOLUME
CONVERTER!||========', 10, 0
    literToCubicFeetConstant dq 0.0353147
    literToCubicInchesConstant dq 61.0237
    literToCubicMetersConstant dq 0.001
    cubicFootToLitersConstant dq 28.3168
    cubicFootToCubicInchesConstant dq 1728.00
    cubicFootToCubicMetersConstant dq 0.0283168
    cubicInchToLitersConstant dq 0.0163871
    cubicInchToCubicFeetConstant dq 0.000578704
    cubicInchToCubicMetersConstant dq 0.0000163871
    cubicMeterToLitersConstant dq 1000.00
    cubicMeterToCubicFeetConstant dq 35.3147
    cubicMeterToCubicInchesConstant dq 61023.7
```

```
    invalidInputPrompt db 'Invalid input. Please enter a valid input. [0 - 12].', 10, 0
    invalidInputPrompt1 db 'Invalid input. Please enter any number.', 10, 0
    enterInputToConvertAgain db 'Convert again? [1 - yes /0 - no]: ', 0, 0
    invalidInputPrompt2 db 'Invalid input. Please enter a valid input. [0 or 1].', 10, 0
    enteredInputToConvertAgain db '%d', 0
    invalidInputPrompt3 db 'String input detected. Please enter a numeric input.', 10, 0

; Section for uninitialized data (BSS section) to store variables
section .bss
    inputChoice resd 1
    inputNumber resq 1
    result resq 1
    enteredInputToConvertAgainValue resd 1

; Main program section
section .text
    global _main
    extern _printf
    extern _scanf

_main:

; Display the main menu
menu:
    push menu_msg
    call _printf
    add esp, 8

    ; Prompt the user to enter a choice
```

```
enterChoicePrompt:
push  menuChoice
call _printf
add esp, 4

; Read and validate user input for the menu choice
push inputChoice
push userInputChoice
call _scanf
add esp, 8

cmp dword [inputChoice], 0
jl error_1
cmp dword [inputChoice], 12
jg error_1
cmp dword [inputChoice], 0
je exit


cmp dword [inputChoice], 1
je literToCubicFeetPrompt1
cmp dword [inputChoice], 2
je literToCubicInchesPrompt2
cmp dword [inputChoice], 3
je literToCubicMetersPrompt3
cmp dword [inputChoice], 4
je cubicFootToLitersPrompt4
cmp dword [inputChoice], 5
je cubicFootToCubicInchesPrompt5
cmp dword [inputChoice], 6
je cubicFootToCubicMetersPrompt6
cmp dword [inputChoice], 7
je cubicInchToLitersPrompt7
cmp dword [inputChoice], 8
```

```
    je cubicInchToCubicFeetPrompt8
    cmp dword [inputChoice], 9
    je cubicInchToCubicMetersPrompt9
    cmp dword [inputChoice], 10
    je cubicMeterToLitersPrompt10
    cmp dword [inputChoice], 11
    je cubicMeterToCubicFeetPrompt11
    cmp dword [inputChoice], 12
    je cubicMeterToCubicInchesPrompt12
    jmp error_1

; Sections for different volume conversion prompts
literToCubicFeetPrompt1:
    ; Print the conversion prompt
    push literToCubicFeetPrompt
    call _printf
    add esp, 8

    ; Jump to the section where the user enters the number
    jmp enterNumber

literToCubicInchesPrompt2:
    ; Print the conversion prompt
    push literToCubicInchesPrompt
    call _printf
    add esp, 8

    ; Jump to the section where the user enters the number
    jmp enterNumber

literToCubicMetersPrompt3:
    ; Print the conversion prompt
    push literToCubicMetersPrompt
    call _printf
```

```
    add esp, 8

    ; Jump to the section where the user enters the number
    jmp enterNumber

cubicFootToLitersPrompt4:
    ; Print the conversion prompt
    push cubicFootToLitersPrompt
    call _printf
    add esp, 8

    ; Jump to the section where the user enters the number
    jmp enterNumber

cubicFootToCubicInchesPrompt5:
    ; Print the conversion prompt
    push cubicFootToCubicInchesPrompt
    call _printf
    add esp, 8

    ; Jump to the section where the user enters the number
    jmp enterNumber

cubicFootToCubicMetersPrompt6:
    ; Print the conversion prompt
    push cubicFootToCubicMetersPrompt
    call _printf
    add esp, 8

    ; Jump to the section where the user enters the number
    jmp enterNumber

cubicInchToLitersPrompt7:
    ; Print the conversion prompt
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```
    push cubicInchToLitersPrompt
    call _printf
    add esp, 8

    ; Jump to the section where the user enters the number
    jmp enterNumber

cubicInchToCubicFeetPrompt8:
    ; Print the conversion prompt
    push cubicInchToCubicFeetPrompt
    call _printf
    add esp, 8

    ; Jump to the section where the user enters the number
    jmp enterNumber

cubicInchToCubicMetersPrompt9:
    ; Print the conversion prompt
    push cubicInchToCubicMetersPrompt
    call _printf
    add esp, 8

    ; Jump to the section where the user enters the number
    jmp enterNumber


cubicMeterToLitersPrompt10:
    ; Print the conversion prompt
    push cubicMeterToLitersPrompt
    call _printf
    add esp, 8

    ; Jump to the section where the user enters the number
    jmp enterNumber
```

```
cubicMeterToCubicFeetPrompt11:
    ; Print the conversion prompt
    push cubicMeterToCubicFeetPrompt
    call _printf
    add esp, 8

    ; Jump to the section where the user enters the number
    jmp enterNumber

cubicMeterToCubicInchesPrompt12:
    ; Print the conversion prompt
    push cubicMeterToCubicInchesPrompt
    call _printf
    add esp, 8

    ; Jump to the section where the user enters the number
    jmp enterNumber

; Section for user input of the number to be converted
enterNumber:
    push userNumber
    call _printf

    push inputNumber
    push userInputNumber
    call _scanf
    add esp, 8

    ; Check if the input is a valid number
    mov eax, dword [userInputNumber]
    cmp eax, 0
    jl error_3
```

```
    ; Compare the inputChoice to determine the conversion to perform
    cmp dword [inputChoice], 1
    je literToCubicFeetPrompt_1
    cmp dword [inputChoice], 2
    je literToCubicInchesPrompt_2
    cmp dword [inputChoice], 3
    je literToCubicMetersPrompt_3
    cmp dword [inputChoice], 4
    je cubicFootToLitersPrompt_4
    cmp dword [inputChoice], 5
    je cubicFootToCubicInchesPrompt_5
    cmp dword [inputChoice], 6
    je cubicFootToCubicMetersPrompt_6
    cmp dword [inputChoice], 7
    je cubicInchToLitersPrompt_7
    cmp dword [inputChoice], 8
    je cubicInchToCubicFeetPrompt_8
    cmp dword [inputChoice], 9
    je cubicInchToCubicMetersPrompt_9
    cmp dword [inputChoice], 10
    je cubicMeterToLitersPrompt_10
    cmp dword [inputChoice], 11
    je cubicMeterToCubicFeetPrompt_11
    cmp dword [inputChoice], 12
    je cubicMeterToCubicInchesPrompt_12

literToCubicFeetPrompt_1:
    ; Implement the conversion logic for Liter to Cubic Feet
    movsd xmm0, qword [inputNumber]
    mulsd xmm0, qword [literToCubicFeetConstant]
    jmp realResults

literToCubicInchesPrompt_2:
```

```
    ; Implement the conversion logic for Liter to Cubic Inches
    movsd xmm0, qword [inputNumber]
    mulsd xmm0, qword [literToCubicInchesConstant]
    jmp realResults

literToCubicMetersPrompt_3:
    ; Implement the conversion logic for Liter to Cubic Meters
    movsd xmm0, qword [inputNumber]
    mulsd xmm0, qword [literToCubicMetersConstant]
    jmp realResults

cubicFootToLitersPrompt_4:
    ; Implement the conversion logic for Cubic Foot to Liters
    movsd xmm0, qword [inputNumber]
    mulsd xmm0, qword [cubicFootToLitersConstant]
    jmp realResults

cubicFootToCubicInchesPrompt_5:
    ; Implement the conversion logic for Cubic Foot to Cubic Inches
    movsd xmm0, qword [inputNumber]
    mulsd xmm0, qword [cubicFootToCubicInchesConstant]
    jmp realResults

cubicFootToCubicMetersPrompt_6:
    ; Implement the conversion logic for Cubic Foot to Cubic Meters
    movsd xmm0, qword [inputNumber]
    mulsd xmm0, qword [cubicFootToCubicMetersConstant]
    jmp realResults

cubicInchToLitersPrompt_7:
    ; Implement the conversion logic for Cubic Inch to Liters
    movsd xmm0, qword [inputNumber]
    mulsd xmm0, qword [cubicInchToLitersConstant]
    jmp realResults
```

```
cubicInchToCubicFeetPrompt_8:
    ; Implement the conversion logic for Cubic Inch to Cubic Feet
    movsd xmm0, qword [inputNumber]
    mulsd xmm0, qword [cubicInchToCubicFeetConstant]
    jmp realResults

cubicInchToCubicMetersPrompt_9:
    ; Implement the conversion logic for Cubic Inch to Cubic Meters
    movsd xmm0, qword [inputNumber]
    mulsd xmm0, qword [cubicInchToCubicMetersConstant]
    jmp realResults

cubicMeterToLitersPrompt_10:
    ; Implement the conversion logic for Cubic Meter to Liters
    movsd xmm0, qword [inputNumber]
    mulsd xmm0, qword [cubicMeterToLitersConstant]
    jmp realResults

cubicMeterToCubicFeetPrompt_11:
    ; Implement the conversion logic for Cubic Meter to Cubic Feet
    movsd xmm0, qword [inputNumber]
    mulsd xmm0, qword [cubicMeterToCubicFeetConstant]
    jmp realResults

cubicMeterToCubicInchesPrompt_12:
    ; Implement the conversion logic for Cubic Meter to Cubic Inches
    movsd xmm0, qword [inputNumber]
    mulsd xmm0, qword [cubicMeterToCubicInchesConstant]
    jmp realResults

realResults:
    ; Display the converted result
    sub esp, 8
```

```
    movsd qword [esp], xmm0
    push dword [esp + 4]
    push dword [esp]
    push resultForGeneral
    call _printf
    add esp, 8
    push newLine
    call _printf
    add esp, 8
    jmp enterInputToConvert

; Read and validate user input to continue or exit
enterInputToConvert:
    push enterInputToConvertAgain
    call _printf

    push enteredInputToConvertAgainValue
    push enteredInputToConvertAgain
    call _scanf
    add esp, 8

    cmp dword [enteredInputToConvertAgainValue], 0
    je menu
    cmp dword [enteredInputToConvertAgainValue], 1
    je enterNumber
    cmp dword [enteredInputToConvertAgainValue], 1
    jg error_2
    cmp dword [enteredInputToConvertAgainValue], 0
    jl error_2

error_1:
    ; Display an error message for invalid input
    push invalidInputPrompt
    call _printf
```

```
    add esp, 4

    ; Go back to the main menu
    jmp enterChoicePrompt

error_2:
    ; Display an error message for invalid input to continue or exit
    push invalidInputPrompt2
    call _printf
    add esp, 4

    ; Go back to the main menu
    jmp enterChoicePrompt

error_3:
    ; Display an error message for string input
    push invalidInputPrompt3
    call _printf
    add esp, 4

    ; Go back to the main menu
    jmp enterChoicePrompt

exit:
    ; Display a exit message
    push thanks
    call _printf
    add esp, 4

    ; Exit the program
    ret
```

GROUP ASSIGNMENT

NAME OF MEMBER	TASK ACCOMPLISHED
Roberto Bayos Jr.	coding, video recording, documentation
John Peter Alcoy	documentation
Marc Christian Tumaneng	coding, video recording, documentation