ASSEMBLY LANGUAGE LAB MANUAL pdf

1: Assembly Language(Lab Manual) - [DOC Document]

1Lab Manual CSC ASSEMBLY LANGUAGE TOPIC 1 INTRODUCTION What is Assembly Language? â€¢ A specific set of instructions for a particular computer system. â€¢ It provides.

Assembly Language Language Programming Programming 2. Thus, the assembler program is a translator that does almost a similar type of work as a compiler. But, how is a compiler compiler different than an a n assembler? One of the major differences to note here is that each high level statement of a C program on compilation will produce many machine statements; whereas an assembly instruction is generally translated to single instruction. We would like to reiterate reiterat e here that assembly and machine languages is machine dependent and programs written in assembly for one microprocessor may not run on other microprocessors. An assembler, assembler, generally, generally, converts an assembly program to an executable executable file. There are two two stand standard ard form formss of execu xecutab table le file filess on DOS. These These files files basicall basically y diffe differr in form format as per per the segmen segments ts of the Micro Micropro proces cessor sor.. The steps of t he assembly process are: You may use any of the following depending on the availability of tools at your center. Each file may be assigned its own options in a single command line. The turbo assembler allows you to assemble programs in groups. Two of the most common common options for turbo assembler assembler are: A common use of command line may be: On assembling a program, a cross-reference file of the programs labels, labels, symbols, and variables variables can be created with an extension extension of. For more details please refer to Turbo Assembler help. The command line for linking a TASM program is: The map file is used to indicate the relative location, size of each segment and any an y errors that the linker has found. You need to enter con for console , console , for such display. Converting Converting Object Files to. TLINK command allows you to convert an object program directly to. Let us discuss the two latest versions of it. It accepts commands of the older versions also. The command that can be used for assembling the program is ML command. This command command has the following format: It requires separate steps for assembling, linking, and converting into. The Th e command command line li ne format for this assembler is: Each file may have its own path and filename, which may be different from the source file path. The following command creates object and cross-reference files with the same name with the suitable extension. You can also link more than one object files to one executable executa ble file by using the command like: Assembler Assembler Tables The important tables of assemblers that are available a vailable in the. Segments and Groups Table: The following details are contained in this table.

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Assembler is the Program that supports an environment for translating assembly language programs to Machine executable files, that is, an assembly program containing statements like MOV AL, 10h and directives like MODEL SMALL, which are meaningless to the microprocessor and so are converted to an equivalent machine program.

The performs these operations using three sets of communication lines called buses - the address bus, the data bus and the control bus. Address Bus The address bus is a group of 16 lines. The address bus is unidirectional: The microprocessor uses the address bus to perform the first function: Each peripheral or memory location is identified by a 16 bit address. The with its 16 lines is capable of addressing 64 K memory locations. Data Bus The data bus is a group of eight lines used for dataflow. The 8 lines enable the microprocessor to manipulate 8-bit data ranging from 00 to FF. Control Bus The control bus consists of various single lines that carry synchronization signals. These are not groups of lines like address of data bus but individual lines that provide a pulse to indicate an operation. The generates specific control signal for each operation it performs. These signals are used to identify a device type which the processor intends to communicate. It then becomes the data bus during the second and third clock cycles. It occurs during the first clock cycle of a machine state and enables the address to get latched into the on chip latch of peripherals. The falling edge of ALE is set to guarantee setup and hold times for the address information. ALE can also be used to strobe the status information. ALE is never 3 stated. Encoded status of the bus cycle: Data is set up at the trailing edge of WR. READY Input If Ready is high during a read or write cycle, it indicates that the memory or peripheral is ready to send or receive data. The CPU, upon receiving the Hold request, will relinquish the use of buses as soon as the completion of the current machine cycle. Internal processing can continue. The processor can regain the buses only after the Hold is removed. HLDA goes low after the Hold request is removed. It is sampled only using the next to the last clock cycle of the instruction. The INTR is enabled and disabled by software. It is disabled by Reset and immediately after an interrupt is accepted. It can be used to activate the Interrupt chip or some other interrupt port. These interrupts have a higher priority than the INTR. It is recognized at the same time as INTR. It is unaffected by any mask or Interrupt Enable. It has the highest priority of any interrupt. None of the other flags or registers except the instruction register are affected The CPU is held in the reset condition as long as Reset is applied. The signal is synchronized to the processor clock. The input frequency is divided by 2 to give the internal operating frequency. SID Input Serial input data line: The data on this line is loaded into accumulator bit 7 whenever a RIM instruction is executed. SOD output Serial output data line: Vss Ground Reference 1. Immediate addressing Data is present in the instruction. Load the immediate data to the destination provided. MOV Rd, Rs Direct addressing Used to accept data from outside devices to store in the accumulator or send the data stored in the accumulator to the outside device. Accept the data from the port 00H and store them into the accumulator or Send the data from the accumulator to the port 01H. The second address is where the data is stored. Note that this requires several memory accesses; two accesses to retrieve the bit address and a further access or accesses to retrieve the data which is to be loaded into the register. From the age of vacuum tubes and transistors, we are now in the age of microprocessors. Due to its adoptability and intelligence, they are used extensively. The purpose of a microprocessor trainer kit is to: Familiarise people of the basic microprocessor hardware. Facilitate testing of hand coded programs with the help of break point setting. Facilitate training with its peripherals also. It has 6 digits of seven segment display and 24 keys keyboard. User can add additional memory on board. Data field is 2 digits wide for 8 bit data of A. Set address and verify the contents of present location. Data is set altered in memory immediately for each hex key entry. User can use the display routine available in the monitor to display their data. Execution with break point with break count facility for easy software debugging. Fill block of memory with constant data in the RAM. Facility to alter any location of RAM in data set mode. Check sum facility for ROM in the same memory test function. It has facility to terminate data, address and control signals on different connectors. It has a crystal connected to it with a frequency as specified under specifications. Display refreshing and keyboard debouncing are performed in hardware by onboard IC. The data, higher order address and control buses are terminated in various connector points. Left most 4 digits of the display represents the address and right most 2 digits represents the data at the displayed address. One keyboard display controlled is used for display refresh and keyboard scanning purposes. The scanning and debounce for a key closure is done by and it uses another 74LS decoder to decode the scan lines. The interrupt output of is connected to RST 7. Port lines One number A programmable peripheral interface is provided on board. The system will function without this IC also. Only logic supply is provided. The port address of various peripheral ICs are a. Then, the display is written to display the power on prompt one character after the other. After completing initialization, the system waits for a keyboard entry and is ready to receive address or function commands. All the hexadecimal keys are entered into the address field. Now to set an address use the hexadecimal keys. Hex key entered is placed in the right most column of the address field after scrolling the existing entry and data at that address is displayed. Once you press this, then the hex keys entered will change the data field and also update the memory contents immediately. In data set mode, hex keys are entered in the data field of the display and corresponding memory location is updated automatically. Hex key entered is entered as LSD least significant digit in the respective field after scrolling the field left by one digit. Data in the register pair FAF. Now, if you want to change F, Enter the new value and the user save area is updated automatically. The display format is the same for DE and HL registers. Next register in the sequence is PC and the display format is as shown below. There is no necessity for using INR key for transferring the displayed data into user save area. When this key is pressed, the display is as shown below Go Fn And within short time comes back and displays user PC as, ch. This means that the present user PC value is H and this is to be checked or changed. If the user program starting address is different it could be entered. When this is done, the monitor desaves all the user registers and then the program jumps to user program. The purpose of this key is to perform non destructive memory test for RAM and display the result. For ROM, the checksum from start to end is computed and displayed. In case of ROM , checksum is computed and displayed. If the memory block exceeds the RAM area display indicates the same. It is a valuable debugging tool. When Br SET key is pressed, the break address is asked for after displaying the function name as shown below. Then the system asks for the break count. When the break address is reached after the required number of break count, break is cleared, registers are all saved and the system enters the register mode displaying PC Monitor uses RST 5 for performing break. The alternate function of the same key is BrCLR.

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learn in ECE lecture that assembly language (or simply "assembly") is important because it is the principal link between the software world of high-level languages like C and Java and the hardware world of CPU design.

Implementing Linux syscalls Compiler patterns We encourage you to run common code patterns, such as for and while loops, switch statements as well as others in the Compiler Explorer available at http: Check this example out. Due to a bug, you need to click Colorise two times to enable coloring annotations Tasks 1. Simple system call [3p] You can check this C source code for a better understanding how the execve call behaves. Use assembly to write a program that receives N command line parameters, and dispatches them to the execve syscall. If the 1st parameter starts with. You can assume the command line parameters are already on the stack, and you can generate the boilerplate code that takes care of this by linking with gcc as opposed to ld: It needs to do the following: Optionally check that argc is greater than one. Call execve system call number 11 directly as a system call read above for the system call convention. Give it some thought! Use 8-bit registers such as al, ah, bl, etc. Looping math [3p] You can find a tutorial on doing assembly-based multiplication and division here. Use assembly to write a program that iterates through a statically allocated string use the. Reuse the basic structure in the previous task. You only need to import puts, declare. Compilers are smart and they produce fairly readable code with -O0, so copy the patterns there. Funny convention [4p] The funny binary is already dynamically linked with a missing library libfunny. The original library was using a funny calling convention, slightly different from the standard one. Figure out the convention, write the wrapper in NASM, and compile the library. Test by running the provided binary. The library is position independent, and exposes 2 symbols: The skeleton is provided in libfunny. Pay attention especially to the distinction between wrt.. Obfuscation [1p] Write a program that does a completely different thing than what objdump will show by jumping into the middle of an instruction. You can use qemu-arm-static to run your binary. Here are some helpful links:

4: Lab 02 - Assembly Language [CS Open CourseWare]

1 Introduction High Level Programming Languages So far your experience programming computers has been with high level programming languages like C.

Each assembly language instruction corresponds to one machine instruction. An assembler is a program that converts source-code programs into machine language. An assembler is a program that translates a program written in assembly language into machine language. Assembly Language source code Assembler Machine Language object code 1. To learn assembly language for its utility: Therefore, a high speed program may have to be written suing a minimum memory space. A compiler is a program, that translate the high-level language programming into machine language. A single command of high-level language is translated into many machine instructions by the compiler. High-level language source code Compiler Machine Language object code 1. In assembly language, you will depend upon this ability to see what the CPU is doing. The most basic tasks i. Find and load the next instruction Execute the instruction: Both control signals and data bits are used when fetching a memory word and placing it in a register. A bus is bi-directional if it allows data to be transferred in two directions. Because of this, instructions using only registers execute more quickly than do instructions using conventional memory. The Intel instruction set requires the use of at least one register for nearly all instructions. Registers are special work areas inside the CPU, designed to be accessed at high speed. The registers are 16 bits long, but you have the option of accessing the upper or lower halves of the four data registers: Each register may be addresses as either a bit or 8-bit value. Each general-purpose register has special attributes: AX is called the accumulator register because it is favored by the CPU for arithmetic operations. BX register can perform arithmetic and data movement, and it has special addressing abilities. It can hold a memory address that points to another variable. The CX register acts as a counter for repeating or loping instructions. These instructions automatically repeat and decrement CX and quit when it equals 0. The DX register has a special role in multiply and divide operations. When multiplying, for example, DX holds the high 16 bits of the product. The segment registers are as follows: The CS register holds the base location of all executable instructions code in a program. The DS register is the default base location for variables. The SS register contains the base location of the stack. The ES register is an additional base location for memory variables. Index Registers Index registers contain the offsets of variables. The term offsets refers to the distance of a variable, label, or instruction from its base segment Index registers speed up processing of strings, array, and other data structures containing multiple elements. The index registers are: This register takes its name from the string movement instructions, in which the source string is pointed to by the SI register. The DI register acts as the destination for string movement instructions. It usually contains an offset from the ES register, but it can address any variable. The BP register contains an assumed offset from the SS register, as does the stack pointer. The BP register is often used by a subroutine to locate variables that were passed on the stack by a calling program. The IP register always contains the offset of the next instruction to be executed. CS and IP combine to form the complete address of the next instruction about to be executed. The SP register contains the offset, or distance from the beginning of the stack segment to the top of the stack. The SS and SP registers combine to form the complete top-of-stack address. Flags Register The flags register is a special bit register with individual bit positions assigned to show the status of the CPU or the results of arithmetic operations. Each relevant bit position is given a name; other positions are undefined. The CPU sets flags by turning on individual bits in the Flags register. There are two basic types of flags: These are the Direction, Interrupt, and Trap flags The Direction flag controls the assumed direction used by string processing instructions. The Interrupt flag makes it possible for external interrupts to occur. These interrupts are caused by hardware devices such as the keyboard, disk drives, and the system clock timer. Often we briefly disable interrupts when peerforming some critical operation that cannot be interrupted. The Trap flag determines whether or not the CPU will be halted after each instruction. Debuggers set this flag so programmers can single-step trace through their programs one instruction at a time. The Carry flag is set when the result of an unsigned arithmetic operation is too large to fit into the destination. For example, if the values and 56 were added together and placed in an 8-bit register such as AL , the result would be too large to fit; the Carry flag would be set. The Overflow flag is set when the signed result of an arithmetic operation is too large to fit the destination area. The Sign flag is set when the result of an arithmetic or logical operation generates a negative result. The flag is used primarily by jump and loop instructions, in order to allow branching to a new location in a program based on the comparison of two values. The Auxiliary Carry flag is set when an operation causes a carry from bit 3 to bit 4 or borrow from bit 4 to bit 3 of an operand. It is rarely used by the programmer. The Parity flag reflects the number of bits in the result of an operation that are set. If there is an even number of bits, the Parity is even. If there is an odd number of bits, the Parity is odd. This flag is used by the operating system to verify memory integrity and by communications software to verify correct transmission of data. The most basic unit of time for machine instructions is called the machine cycle. Each tick of the clock determines when the next machine cycle will occur. Machine instructions on Intel processors generally take between 3 and 20 clocks to execute, depending on whether they access memory or need to calculate a complex address. In assembly language, variables are identified by labels. Each label shows the starting location of a variable. We use data definition directives to allocate storage, based on the following predefined types: The following syntax diagram shows that name is optional, and only one initialvalue is required. If more are supplied, they must be separated by commas: Initialvalue can be one or more 8-bit numeric values, a string constant, a constant expression, or a question mark? Or numeric expression can initialize a variable with a value that is calculated at assembly time. When the variable is moved to a bit register, the re-reverses the bytes.

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