Escuela Politécnica Superior

UAM

Microprocessor-Based Systems Laboratory

Lab Session 4. Resident programs and RTC.

In cryptography, a Caesar cipher, also known as Caesar's cipher, the shift cipher, Caesar's code or Caesar shift, is one of the simplest and most widely known encryption techniques. It is a type of substitution cipher in which each letter in the plaintext is replaced by a letter some fixed number of positions down the alphabet. For example, with a left shift of 3, D would be replaced by A, E would become B, and so on. The method is named after Julius Caesar, who used it in his private correspondence.

The objective of this practice is to create a resident program that will install an interrupt vector in INT 55h that shall provide the following services:

- AH=12h. Print in screen the string encrypted to Caesar's code.
- AH=13h, Print in screen the string decrypted from Caesar's code.
  The strings shall be pointed by DS:DX and they shall end with $

Each team will have a different codification number. By default, it will be teamgroup+3 (.i.e team 4, N=7). Details concerning the development are open to the student, such as considering capital/lower case letters, include numbers, symbols, etc

Program 1: p4a.asm (4 pts)

Write an assembly program (.COM) to:

- Implement a Interrupt Service Routine in INT 55h, to provide the services described previously in AH=12 and AH=13.
- When executed without any parameter, it shall show the installation status of the driver (installed/uninstalled), the team number and the names of the programmers
- When executed followed by the /I parameter, it shall install the driver in case it is not installed previously. In case a different driver is present, a question may be offered to the user to overwrite the driver.
- When executed followed by the /U parameter it shall uninstall the driver in case it is installed previously.

Program 2: p4b.asm (3 pts)

Write a program to verify the correct behavior of the resident program p4a using the encryption/decryption new features included in the int 55h.

The RTC (Real-Time Clock)

The RTC can generate periodic interrupts, alarms and hardware signals, but they are not generated by default. It generates interrupt 70h and is connected to IRQ 0 of the slave PIC.

Register B is used for determining what event has raised the interrupt (alarm, periodic interrupt or change of time/date). The interrupt service routine must verify if the event that has raised the interrupt is the desired one by reading register C.

At the end of the interrupt routine, it is necessary to send the corresponding EOIs to the slave and master PICs (8259).

Program 3 p4c.asm (3 pts)

Write a new program to print out in screen the characters encrypted to Caesar's code using the previously installed interrupt (RTC) for a given string typed from the keyboard.

The following constrains hereunder shall be taken into account:
- The characters shall be printed in a rate of 1 character per second.
- Strings may be typed from the keyboard until it is received the string "quit". In that case, the program shall exit and return the control to the O.S.
- When received the string "cod", the program shall print out the next string encrypted (option by default).
- When received the string "dec", the program shall print out the next string decrypted.

To include the RTC ISR, it is advised to modify the program p4a.com.

DELIVERY: Date and contents

Upload to Moodle a ZIP file containing the source files (only the .asm) of the exercises and the makefile. Only one member of the team may upload the file. The files shall contain the authors' name and the team number in the header.

The source files shall be correctly tabulated and commented. The lack of comments or poor quality comments will be qualified negatively.

The deadline to upload the files is May 3rd at 23:55h