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Homework 5
COMP 3350
Questions 2-5

2. The ftp program (a common Unix utility used to transfer files to/from a remote machine) has a number of options, including options to • Attempt to use an anonymous login, rather than asking the user to enter a username and password. • Enable interactive prompting when multiple files are transferred at once (i.e., don't ask the user to confirm every single transfer) • Enable verbose mode, which displays informative messages during file transfers. a. Suppose you are implementing ftp in assembly language and want to store these three options in a bit set.

Define a symbolic constant for each of the three options.

USE_ANONYMOUS_LOGIN   **= 0Ah**   **;00001010b off state**

ENABLE_INTERACTIVE_PROMPTING   **= 0Bh**   **;00001011b on state**

ENABLE_VERBOSE_MODE   **= 0Ch**   **;00001100b on state**

b. Suppose you will store the set of options selected by the user in a BYTE variable called options. By default, ftp will not use anonymous logins, it will use interactive prompting, and verbose mode is enabled. To represent this set of defaults, what should the value of options be? (Use the symbolic constants above in your declaration; do not use "magic numbers.")

.data
options BYTE USE_ANONYMOUS_LOGIN, ENABLE_INTERACTIVE_PROMPTING, ENABLE_VERBOSE_MODE

c. Write sequences of assembly language instructions to change the value of options as follows:

(i) Enable the ENABLE_VERBOSE_MODE option (or, if it's already enabled, leave it enabled).

CMP [options + 2], ENABLE_VERBOSE_MODE
JE IfAlreadyEnabled   ;Some where else in the code, leave enabled
NOT [options + 2]

(ii) Disable the USE_ANONYMOUS_LOGIN option (or, if it's already disabled, leave it).

CMP[options], USE_ANONYMOUS_LOGIN
JE IfAlreadyDisabled   ;Some where else in the code, leave it disabled
NOT [options]

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(iii) Toggle the ENABLE_INTERACTIVE_PROMPTING option – i.e., turn if off if it's on, and turn it on if it's off.

NOT [options + 1]   ;Toggle it

(iv) If the ENABLE_VERBOSE_MODE option is enabled, jump to the label displayResponse.

CMP [options + 2], ENABLE_VERBOSE_MODE
JE displayResponse   ;Jump to displayResponse if it is enabled; it is enabled by default

(v) If the USE_ANONYMOUS_LOGIN option is disabled, jump to the label inputCredentials.

CMP[options], USE_ANONYMOUS_LOGIN
JE inputCredentials   ;Jump to inputCredentials if it is disabled; it is disabled by default

3. The LAHF (Load AH from Flags) instruction copies the low byte of the EFLAGS (bits 0–7) into the AH register. Write a sequence of instructions that will set EAX to FFFFFFFFh if the zero flag is set and 00000000h otherwise, using only LAHF and bitwise operations (no conditional jumps). Briefly comment each instruction to explain why your solution works.

LAHF   ;Load AH from Flags
SHL EAX, 17   ;Shifts the bits in EAX left 17 bits
SAR EAX, 31   ;Shift the bits in EAX right 31 bits and keep the sign bit

4. Suppose you want to swap the values in AH and AL. Write an instruction to do this using a bitwise rotation.

ROR AX, 8 or **ROL AX, 8**

5. When an Internet Protocol (IP) packet is transmitted across a network, the first byte of the packet is divided into two parts: the high four bits represent the version number, and the low four bits represent the "Internet Header Length" or IHL. Both are 4-bit unsigned integer values.

a. Suppose the first byte of the IP packet is stored in DL. Write a sequence of instructions that will load the version number into EAX (zero-extending it from 4 bits to 32 bits).

SHR DL, 4   ;Move top of 4-bits to the lower 4-bits of DL
MOVZX EAX, DL   ;4bit extend up to 32-bits in EAX

b. Suppose the first byte of the IP packet is stored in DL. Write a sequence of instructions that will load the Internet Header Length into EAX (zero-extending it from 4 bits to 32 bits).

ROR DL, 4   ;Switch the top 4 with the bottom 4 bits
SHR DL, 4   ;Move top of 4-bits to the lower 4-bits of DL
MOVZX EAX, DL   ;4bit extend up to 32-bits in EAX

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Or

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AND DL, 00001111b      ;Clear top bits, keep lower 4-bits
MOVZX EAX, DL          ;4bit extend up to 32-bits in EAX
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