

Tutorial 0x0000

Objectives

- Familiar with the practical environment
- Understanding data representation and CPU architecture basics

UBUNTU VM

Note: We are using the same Ubuntu20.04 VM that you have given during the lab induction session.

Power up the virtual machine and log in to the VM with the below credentials

Username: csc Password: csc

Task 1: Understanding your CPU

1. Find CPU details on the Ubuntu 20.04 VM?
2. How do you know if you are on a 32/64-bit CPU?
3. How do you know your CPUs additional capabilities such as FPU, MMX, SSE, SSE2 etc.?
4. Discuss the difference between CPU registers and cache (L1, L2 and L3)

1. neofetch/lscpu → Ryzen 7 2700x
2. uname -a → x86_64 (64 bit CPU)
3. list of flags displayed when using lscpu
4. Registers stores data and instructions relevant to the current process. One register usually only has enough space to store one instruction or memory address. Cache stores frequently used data and instructions so they don't have to be fetched from RAM

Task 2: Data Representation and Binary Conversions Basics

- a. Convert 123_{10} to binary

128	64	32	16	8	4	2	1
0	1	1	1	1	0	1	1

0111 1011

b. Convert the following unsigned decimal integers to 8-bit hexadecimal representation

- a. 125
- b. 100
- c. 254
- d. 128
- e. 32

a. 0x7D
 b. 0x64
 c. 0xFE
 d. 0x80
 e. 0x20

c. Convert unsigned 32768_{10} to 32-bit hexadecimal representation

0000 0000 0000 0000 1000 0000 0000 0000

0x00008000

d. Demonstrate how the following values would be stored in a machine with 32-bit address space, using little endian format. Assume that each value starts at memory address 1020.

- I. 0x45D7B469
- II. 0x765B21A0
- III. 0x164ED543

Mem Addr	Data I	Data II	Data III
1020	69	A0	43
1021	B4	21	D5
1022	D7	5B	4E
1023	45	76	16

- e. Discuss how Least significant Bit (LSB) manipulating works in digital steganography

By altering the LSB of a file you are able to manipulate the bits in such a way you can hide text, sound data, files inside of other files data. The LSB is used as it does not cause wild and large variations in the values of each byte changed, allowing you to hide the data but all the file to present the same to the human eye.

Task 3: IA 64bit General Registers, Flags

Reading: Try to familiarise yourself with the IA 64bit General Purpose Register, Flag terms and their usage. We will be using them a lot in the coming weeks

