CIA Lab 1 Assignment: Booting 1

Abstract
In the coming weeks, you will be working with your experimentation environment. You have already installed an Ubuntu distribution and now you will look at the way it boots and initializes the system.

Introduction

This assignment includes topics not yet covered during the lectures. We want you to try to find the right information yourself in order to complete the assignments. Choose your sources of information carefully and reference them to support your answers. As previously stated you are to keep a log of your progress, including choices or assumptions made, problems encountered and answers to the questions posed.
Moreover, each student will use an experimentation computer during the year and you will find yours from your TAs.

For writing your report, please consider the following bullet points:

- File:
  - Filename should help to identify your report (e.g. CIA 1st Lab YOURNAME_SURNAME).
  - File format should be HTML or PDF.
- Structure and content:
  - It should follow the structure of the assignment - mention or follow the task numbers in order.
  - Provide the important steps which you are going through, and eventually additional interesting information and links.
  - Provide the configurations and the command lines with proof of work provide outputs (screenshots or text) for acceptance testing.
  - Label pictures and refer to them in the text by the label.
- Format:
  - You can use any text editor/format for your lab reporting, here is an example of using HackMD online (markdown language). Link
- English:
  - One of the skills that should be obtained by you is technical writing in English.
  - Use special services to check your report before submission (f.e grammarly - but select a proper mode, it has multiple modes).
- External sources:
  - You can and should use external sources, but answers to the questions should be given in your own words, copy/paste in the answer is forbidden. That is needed to show that you understand what you have written (of course you can just paraphrase the text, but the effort is nearly equal to understanding the material and explaining it in your own words).
  - You can use quotes from external sources to reinforce your explanation, but quotation alone is not considered as an answer - answer requires your insight.
  - External sources that were used should be listed in the report. If it is not a quote, you can place them right after the answer/section (or after the report if they are relevant to the report overall). If there was a quote, the eternal source should be specified next to it.

- Discussion among students:
    - In general, assignment tasks can be discussed among students, but tasks and reports should be done individually. But be careful, there is a high level of diversity on ways how a particular task can be made, and if two students are choosing the same way and making the same mistakes it is highly suspicious.

Note: TAs might come before the deadline of the lab in order to check your lab demo.

Task 1 - PXE Installation

➢ **PXE Server Setup**

Create the first virtual machine using VirtualBox and isolate a private network on your workstation: do not pollute our shared network with your own DHCP service. There are several network settings offered by VirtualBox, choose the right one accordingly and Install your PXE server there.

Question: why not run your DHCP service on the SNE network directly?

Hint: you need to set up DHCP + TFTP and some boot loader e.g. PXELINUX.

Your PXE server should serve the operating system of your choosing.

➢ **PXE Client Setup**

Create the second virtual machine using VirtualBox in order to test the PXE service - boot and install a new system with it and show the proof in the report.

Task 2 - Questions to answer

1.
    a. What is UEFI PXE booting?
    b. How does it work?
2.
    a. What is a GPT?
    b. What is its layout? Explain each element.
    c. What is the role of a partition table?
3.
    a. What is gdisk?
    b. How does it work?
    c. What can you do with it?
4.
    a. What is a Protective MBR and why is it in the GPT?

Task 3 - Partitions

Boot into Ubuntu and use the **dd utility** to dump the Protective MBR and GPT into a file in your home directory. Use a **hex dump utility** to look at the raw data in the file.

1. Copy and dump the Protective MBR and GPT in hex format (do not forget to submit them also in your moodle account submission entry) and fully annotate the entries in the report. This means you must describe the purpose of every field, and translate all fields that have a numerical value into human-readable, decimal format.
(a) At what byte index from the start of the disk do the real partition table entries start?
(b) At what byte index would the partition table start if your server had a so-called “4K native” (4Kn) disk?

2. If you wanted to add a (1 + your student PC number, e.g. st6) GiB FreeBSD ZFS partition, called ØS3 (U+00D8U+015A U+0033) to the table by hand, what values would you have to use for the entry (including the name) in the raw table on disk? Assume the disk is large enough to hold the extra partition after which you already described.

3. Name two differences between primary and logical partitions in an MBR partitioning scheme.