Assignment 0: Software environment and ARM review

Due date: none

Nothing is required to be turned in for this assignment, but everyone should have the software environment for the course configured and tested by next class.

1 Ubuntu 20.04 VM

Instructions for software configuration will be given assuming an operating system of Ubuntu 20.04. While you may elect to use whatever operating system you prefer, it is recommended to install a virtual machine with Ubuntu 20.04 for use in this course.

1.1 Install virtualization software

There are multiple virtualization software products that are sufficient to host the virtual machine. Some examples are:

- VirtualBox: https://www.virtualbox.org/

- VMWare Workstation Player:
  https://www.vmware.com/products/workstation-player/workstation-player-evaluation.html

- Hypervisors provided by your host OS (QEMU/KVM on Linux; Hyper-V on Windows)

1.2 Install Ubuntu 20.04

The Ubuntu 20.04 installation ISO is available here:
https://releases.ubuntu.com/20.04.1/ubuntu-20.04.1-desktop-amd64.iso
The following parameters should be sufficient for your VM:

- Memory: 4 GB

- Disk space: 20 GB

- NATed network adapter, so that the virtual machine can access the Internet

- 'Minimal installation' within the Ubuntu installer

Students are free to provide the VM with more resources or install additional software if desired.

2 Ghidra

Many of the projects in this course will use Ghidra for software reverse engineering. Install Ghidra and take the opportunity to familiarize yourself with the user interface by importing and analyzing some executable files.

2.1 Installation

- Install the Ghidra dependencies:

  ```
  apt-get install openjdk-11-jre openjdk-11-jre-headless openjdk-11-jdk \
  openjdk-11-jdk-headless
  ```

- Download the latest version of Ghidra from https://ghidra-sre.org

- Unzip the Ghidra installation in your location of choice

- Run the `ghidraRun` script in the unzipped directory to launch the application

2.2 References

- In the Ghidra installation directory: `docs/CheatSheet.html`

- In the Ghidra installation directory: `docs/GhidraClass/`

3 ARM review

If you are unfamiliar with the ARM instruction set, it is strongly encouraged that you read through the first reference below. Some ARM executables have been provided in the `resources` directory so that you can compare the disassembled output to the associated source files. We will review the ARM instruction set in class, but you would be well served to spend some additional time familiarizing yourself with it if this is your first exposure.

- Azeria Labs ARM assembly overview:
  https://azeria-labs.com/writing-arm-assembly-part-1/

- ARM Assembler Guide:
  http://infocenter.arm.com/help/index.jsp?topic=/com.arm.doc.dui0068b/index.html

- ARMv7-A Architecture Reference Manual:
  http://infocenter.arm.com/help/index.jsp?topic=/com.arm.doc.ddi0406c/index.html
  and
  https://static.docs.arm.com/ddi0406/c/DDI0406C_C_arm_architecture_reference_manual.pdf

If you would like to execute the binaries in the `resources` directory, install the `libc6-armel-cross` and `qemu-user` packages. You can then execute them in QEMU's userspace emulation mode:

```
qemu-arm -L /usr/arm-linux-gnueabi/ ./arm-hello-world
```