Aalto University
School of Electrical
Engineering

Department of Communications and Networking
ELEC-E7330 Laboratory Course in Internet Technologies

40 – Breaking Isolation

Instructions

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1 General Information

There is only one report to return in this labwork. Return it as the “final” report in the Reservation system. And all the work is done outside of the lab room. Students reserve a lab time in the reservation system for presenting what they have done etc. Meaning, this time is not meant for doing the lab. Take with you a laptop where the whole setup is installed and running or Virtualbox images that can be installed on lab’s computer. Take also the report with you.

As a group this labwork is worth 54 hours.

2 Task Description

This laboratory works is designed to make the students familiar with main concepts and ideas behind the Linux containers or simply LXCs. Definition of Linux container, the main components, configurations, and security considerations among different LXCs are the main topics covered by this laboratory work.

3 Virtualization and Linux Containers

Virtualization and virtualization technologies are one of the most interesting enhancements in world of networking. Virtualization make better and more efficient use of the computing resources such as available CPU, RAM and storage by allocating and sharing those resources among different virtually entities such as virtual machines or containers.

4 Warmup questions

Before starting, go the following questions through and give answers in the report.

Question 1

What are the benefits of using Linux containers?

Question 2

Using your own words try to explain the similarities and differences between Linux containers and Virtual machines. Which one is more efficient?

Question 3

What are the restrictions and limitations of using the Linux containers?

Question 4

What are the main components behind Linux containers responsible for isolating different containers and their resources from each other’s? Give a brief explanation about each of them.

5 Exercises procedure

Now build the following configuration to your laptop or to your desktop computer. If you build up the configuration on desktop computer, remember the Virtual box image with you to the presenting appointment.

Use VirtualBox and install Debian Linux distro with enough amount of RAM, CPU and storage for creating at least 3 containers called container A, B and C (According to figure 1). Hereafter we will call this virtual machine as "host" machine. You need to provide the exact commands and configurations used to set up following scenario in your final report.

Container Name	IP Address	Subnet Mask	Default Gateway
Container A	10.0.0.10	255.255.255.0	10.0.0.1
Container B	10.0.0.11	255.255.255.0	10.0.0.1
Container C	10.0.0.12	255.255.255.0	10.0.0.1

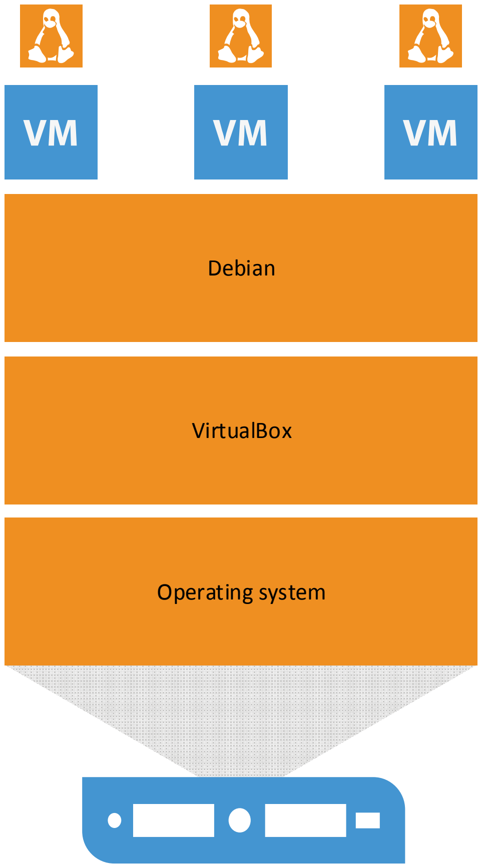

Figure 1.

1. Create a bridge interface called "virbr0" inside the host machine and assign it the IP address of 10.0.0.1/24.
2. Create 3 different container where each container is allowed to use only two core of CPU (if available) and 256 MB of RAM.
3. Start the containers and log-in into the machines. Containers must be able to reach each other using their assigned IP addresses.
4. Install different programs/processes on each container. They cannot be the same programs which are already run on the host computer.

6 Intermediate point

When you have done all things so far, reserve a lab time for your group for discussing (and supervising) on your work. If you cannot see any available lab time at the reservation system, please contact Juha.Tapio.Jarvinen@aalto.fi.

7 Break the Isolation

In this section you try to break the isolation. Use the literature, too. Justify, for example, by using peer-reviewed publications. Give your findings in the report.

1. As all containers are residing on a same host try to access available processes on container A from container B. Try to explain your finding using your own words.
2. How can you access available processes on containers A or B from the host?
3. Use some attacks found in literature or written by you to break in on containers A and B. Categorize your attacks (for example, network, host, guest, guest-to-guest)
4. Try to use packet capture tools such as Tcpdump or Wireshark on the container C to access packets destined to containers A or B.
5. How does containers A and B look like from the container C point of view? How does the containers look like from the host outside the host? Is it possible to detect if they are running as container or individual physical servers?

8 Finally

Write the report and return it to the Reservation system as the “Final report”. In the report explain also what you have done, include also the most important parameters etc (and all the things what you think that are important).

9 References

- A tutorial on LXC on Debian

  https://wiki.debian.org/LXC

- A tutorial on Bridge Utils on Debian

  https://wiki.debian.org/BridgeNetworkConnections