

Visualizing the Migration Process of Virtual Machines

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I. INTRODUCTION

Virtualization technologies promise a reduction of the energy costs [1], improved hardware utilization, and dynamic resource allocation. Those technologies introduce a new layer of abstraction between hardware and software. By using a hypervisor as, e.g., the open source Proxmox [2], multiple virtual operating systems can be managed on a single physical machine due to virtualization. Those virtual machines can be migrated to another physical machine whenever required, e.g., to balance the load of a physical machines. Further, modern migration technologies are able to transfer a virtual machine during operation to other physical machines.

However, regarding network security, hardware virtualization also introduces new attack vectors. Basic security challenges in this virtual environments have already been discussed by Garfinkel et al. [3]. Further, Oberheide et al. [4] categorized migration attacks and discussed the effects of an man-in-the-middle attack. König et al. [5] stated that it is essential to be able to detect an online migration process in order to detect an unauthorized migration of initiated by a possibly compromised hypervisor. This demo visualizes the mechanism that has been proposed by König et al. to detect a online migration process of a monitored virtual machine.

II. VISUALIZATION TOOL

This demo visualizes on one hand, that an online migration of a virtual machine may not be noticed by the user of this machine at all. Therefore, we streamed a video by a virtual machine as an example application. This streaming node is run on top of a Proxmox hypervisor that is provided by a node within the G-Lab [6] testbed. As shown in this demo, a virtual machines that streams a video can be migrated without affecting the quality of this service as, e.g., stalling the playback. This is a result of the online migration, as the virtual machine is available even most of the time when it is transferred to another physical machine. Further, due to the caching of the video, the short downtime of the streaming machine can not be noticed by any user watching this video.

Due to this, a monitoring system is required in order to enable the owner of a virtual machine to detect an online migration. In this demo we visualize the monitoring mechanism proposed by König et al. Therefore, ICMP messages have to be sent from the monitoring entity to the virtual machine and the round trip time of those messages have to

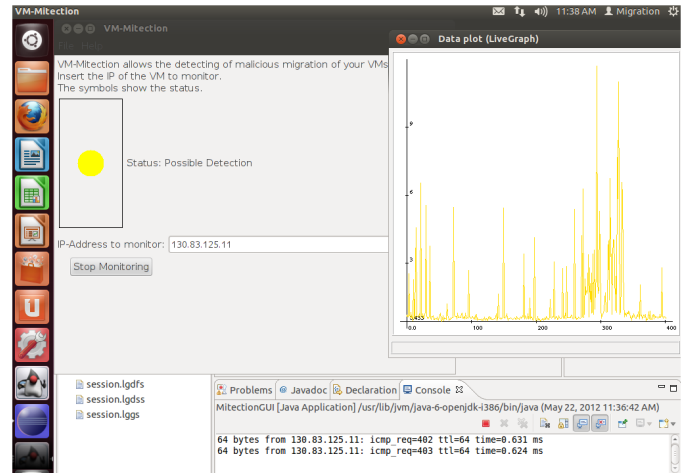


Fig. 1. The visualization of the migration detection mechanism

be analyzed. This monitoring can either be located on the same hypervisor or on an external node. As mentioned before, during online migration the virtual machine is not available for a short amount of time. Due to this, the round trip time of the ICMP is strongly increased when the virtual machine is not available. As shown in Figure 1, this demo visualizes this detection mechanism by showing a live graph on the right side with the round trip times of the sent ICMP packets. The peaks of the round trip time indicates a migration. We also implemented a algorithm that analyses the measured round trip times in order detect unusual peaks that may indicate an online migration. The results of this algorithm are visualized via a traffic light.

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