An Universal Framework for Remote Experimentation with Internet Security Techniques

Andreas Bischoff, http://prt.fernuni-hagen.de/~ bischoff/

To provide our students with a practice for an internet security courseware we have developed an universal framework which allows remote experimenting with internet security issues. To realize a really universal, secure and reusable environment we have chosen VMWARE GSX Server [1] virtualization techniques. The VMWARE product chain establishes virtual machines which emulate common PC Hardware on X86 based Linux or Windows operating system (OS). This solution is completely transparent for the software (OS, applications, etc.) running on top of the virtual machine. Even the emulation of multiple virtual machines is possible if enough system resources (Memory, CPU speed) are available. The installed OS environment has only dependencies on the virtual, emulated hardware and is therefore independent from real used hardware. With the usage of the described virtualization techniques, every virtual machine can easily be restored to a defined state. The system establishes three virtual machines connected by a virtual network to provide various 'man in the middle'

Figure 1: System structure

attack scenarios for experimentation. The virtual network is completely separated for the real internet to provide a safe sandbox. Every virtual machine can be controlled by the platform independent opensource remote desktop 'Virtual Network Computing' (VNC). The students are able to book a timeslot for individual experimentation by use of the web interface of our universal reservation system (URP). An application server controls authentication, validates time slots, logs user activities and restores the virtual machines to the initial state after experimentation. Students can work with their Java enabled webbrowsers, there is no need to install software locally. Student tasks for online experiments and virtual machine images were created by [2].
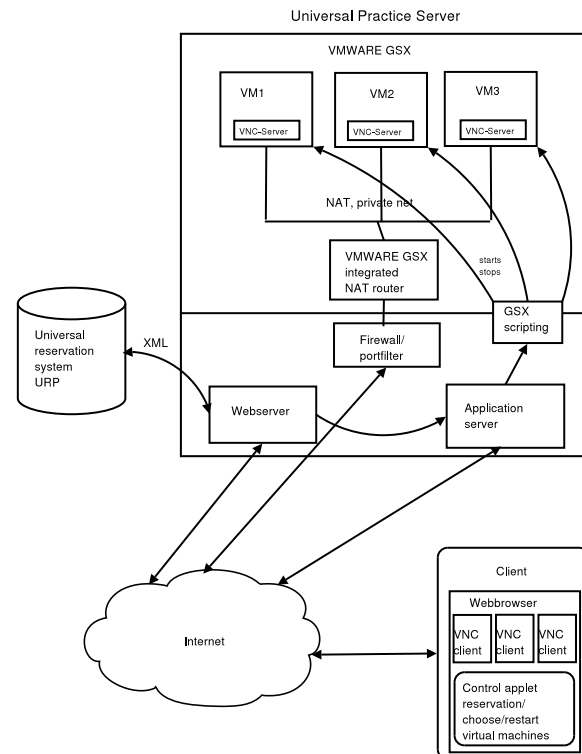
[1] http://www.vmware.com/

[2] Marcus Nickel. Lernumgebung für ein Online-Praktikum zur IT-Sicherheit auf der Grundlage eines virtuellen Netzes, Diploma Thesis, University of Hagen, Department of Electrical Engineering and Information Technology, 2005.