Hasso Plattner Institut
Digital Engineering · Universität Potsdam

Master Project SoSe 2019/20
A Cyber Range for Hands-On Security Exercises

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Background

Obtaining hands-on practice with computer networks is difficult. Most people do not own multiple, spare computers to setup a scenario at home, while on campus resource-intensive, large-scale exercises can only be provided for a short time and not on demand. This is especially true when it comes to security-related exercises, where part of the assignment — and the excitement — is to experience what happens when things go wrong.

The goal of this project is to build a so-called "cyber range", an environment where each student can create and operate a large-scale realistic network, and experiment with it in a protected environment. We plan to use this cyber range in the upcoming semester(s) to realize hands-on components to the new network security courses, so that students can gain first hand experience how cyber attacks work and how to defend against them.

Tasks

For this environment, the team will need to develop a software that can spin up and configure a set of virtual machines per student based on a machine-readable configuration file. Machines are either virtualized on local servers or leased from cloud providers, and made available via a personalized VPN entry point and a dashboard. The specification document lists which software needs to be installed and configured on each machine (for example a web browser), and automatically executes scripts that will simulate a workload (for example every 5 minutes the web browser opens a certain web site, or an email client checks for mail).

The software checks the progression of the learner within the exercise so that feedback could be provided by the system (as specified in the config file), and monitors the virtual network for health and when resources can be released back to the pool. The system offers a hook into learning management systems such as Moodle, so that exercises can directly be started up from within the lecture material.

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