The Center for Cyber Defenders
Expanding Computer Security Knowledge

Verifying the Usefulness of Experimental Data from Virtual Test Beds

Allen T. Webb—Texas A&M University , Johahn Wu—University of Texas

Todd Jones, 5638; Kasimir Gabert, 5638

Problem Statement:
Cost often drives simulated or modeled experiments to be used to answer questions of interest. Unlike more model-rich domains like nuclear weapons and aerospace, the models for cyber science emulation are lacking in established Verification and Validation (V&V) techniques. We seek to address the problem of how to verify whether experiments done in a virtual environment are able to answer a question of interest in cyber adequately.
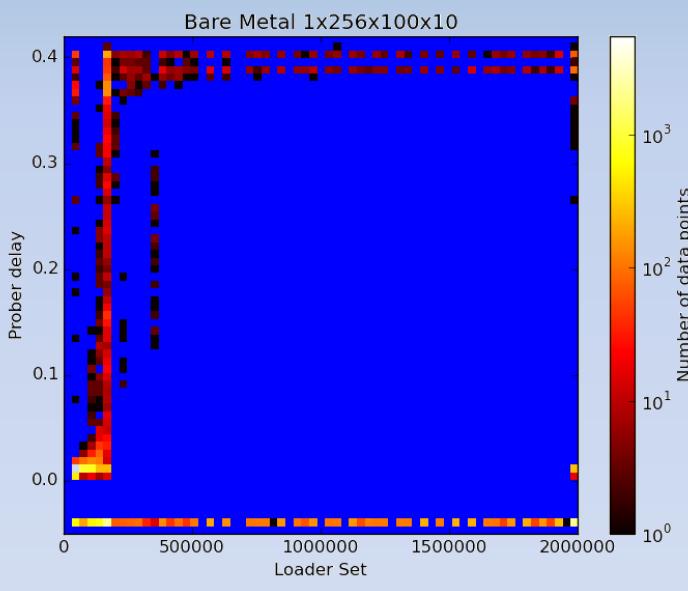
Objective and Approach:
We want to create a end to end V&V system to help determine the accuracy of cyber emulation systems. To do so, we conducted a set of experimental trials on bare-metal hardware to be compared against previous data collected in a virtual environment. We then used the data to determine the circumstances for which the two sets of data are statistically distinguishable.

Results:
To begin with, we started with two separate questions of interest: distinguishing based on absolute values (looking at absolute response times over varying load patterns and hardware configurations) and distinguishing based on relative values (looking at percent change in response time over percent change in load). In both cases we were able to distinguish with significance, a difference between values from a emulated and a bare-metal environment.

Impact and Benefits:
Our work makes it possible to know whether conducting experiments in a virtual environment will answer the question of interest for a real environment. We expect our results to direct further improvements in virtualization to bring its features and performance closer to real world systems.

Bare Metal 1x256x100x10

Drop Proption