Virtual Interfaces for Exploration of Heterogeneous & Cloud Computing Architectures

Hal Martin and Wayne G. Lutters, *University of Maryland*

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Hal Martin
University of Maryland Baltimore County
1000 Hilltop Circle
Baltimore, MD 21250
hmarti2@umbc.edu

Wayne G. Lutters
University of Maryland Baltimore County
1000 Hilltop Circle
Baltimore, MD 21250
lutters@umbc.edu

Abstract

In recent years data center operations have evolved into extensive infrastructures that can support of a wide range of computing paradigms, from traditional application hosting and data storage to service oriented architectures (SOAs) and emerging cloud services. Offering various mixes of software, platform, and infrastructure as a service (SaaS, PaaS, IaaS), more recent advances in software defined networking (SDN), combined with ubiquitous computing and IP convergence (voice, video, data) on end-point devices such as smart phones and tablets, have only added complexity to the delivery of business services.

This situation is further complicated by recent waves of mergers and acquisitions of these services by competing firms. In the commercial sector this has resulted in the creation of hybrid infrastructure resulting from the combination of the many different post-merger sites. These conglomerations are a soup of disparate applications, operating systems, data storage, communications protocols and networking fabrics, with various service and maintenance arrangements.The result is that information technology departments are are tasked with satisfying an ever expanding set of requirements and diversifying technical base.

One of the most daunting tasks post aggregation is the initial discovery and remote evaluation of the newly acquired, unexplored, legacy data center and network computing resources by an IT staff. When faced with performing discovery tasks, IT staff can be highly constrained by factors such as distance, time, risk identification, and knowledge from both a technology and corporate IT history standpoint. Research is required to understand the best practices for initial reconnaissance, combined with ongoing monitoring and analytics of the newly integrated infrastructure. This requires innovation in both system administration methods and tools.

While there have been some recent commercial advances, these IT vendor tool suites are expensive, complicated, and require significant resources to deploy. Their codebase and underlying methods remain proprietary. To advance the scientific understanding of these practices, we require assemblages of open source software tools and careful evaluation of human actors.

Thus, this project intends to advance the discipline by two major advances. The first is developing an instrumented evaluation testbed that provides generic infrastructure services, general user activity, and advanced computing constructs (Cloud, Software Defined Networking, etc.) in a simulated data center environment (SDCE). The second part is a Virtual, Interactive, Collaboration and Information Exchange Environment (VICkIEE), for performing such evaluations. Combined, these two components can be used for validating various data center configurations, evaluation methodologies, and tool suites for use in this task.

The VICkIEE is intended to be a real time, multi-tool, windowed UI with a shared collaborative interface to support multiple simultaneous system analysts. By remotely deploying the VICkIEE into a data center environment, operations can be performed with the same fidelity that local access provides. Future work intends to pursue user evaluations of the VICkIEE software suite to support discovery using a prototype SDCE in Fall 2014 with students enrolled in local cybersecurity and Information Technology programs.