

# **Novel Orchestration of Virtualization to Improve Cybersecurity: Software Defined Infrastructure (SDI) as a Foundation for Clean-Slate Computing Security**

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## Abstract.

In 2017 VMware Research launched a three-year research program in collaboration with the U.S. National Science Foundation (NSF), to achieve “Clean-Slate Computing Security” by combining multiple threads of cloud-scaled and enterprise-grade virtualization and data-abstraction capabilities designed to advance the state of the art in key areas relevant to the C&ESAR Conference. Specifically, this paper describes the program’s use of Software Defined Infrastructure (SDI) in novel fashion to secure network and data traffic through richer and deeper situational awareness, network micro-segmentation and automation all the way from the core datacenter, to the public clouds, to the edge of IoT and back. The SDI-CSCS approach extends the VMware core technology stack across the cybersecurity and virtualization landscape, and the paper outlines the academic and lab advances already reported. Further, the paper describes new uses of Machine Learning and algorithmic exploitation of the behaviors of the virtualized infrastructure, demonstrating more responsive and predictive systems in the event of attacks. The paper also describes the extension of the SDI approach for Internet of Things and edge-computing architecture security.

## Keywords:

research; software-defined; SDI; SDN; virtualization; machine-learning; orchestration; networks; network-functionality-virtualization;