

# The Effect of UCX Machine layer on Charm++ Simulations

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## Abstract

From concept to engineering, and from design to test and manufacturing, engineers from a wide range of industries face the ever-increasing need for complex and realistic models to analyze the most challenging industrial problems; Analysis is performed to secure quality and speed up the development process. Sophisticated programming model and software have been developed aiming to tackle the need for computational simulations with superior robustness, speed, and accuracy. These simulations are designed to run effectively on large-scale computational High-Performance Computing (HPC) systems.

The new generation of InfiniBand In-Network Computing technology includes several elements, such as Scalable Hierarchical Aggregation and Reduction Protocol (SHARP)<sup>™</sup>, smart MPI hardware Tag Matching, rendezvous protocols, and more network offload mechanisms. These offload technologies are in use at several of the recently deployed large-scale supercomputers around the world, including the top TOP500 platforms.

Unified Communication X (UCX) is an open-source production grade communication framework for data centric and high-performance applications. UCX is a collaboration work between industry, laboratories, government (DoD, DoE), and academia which enabled the highest performance through co-design of software-hardware interfaces.

Mellanox has implemented the UCX machine layer for Charm++ and conducted performance investigations, including low-level and application benchmarks, to evaluate its performance and scaling capabilities with the InfiniBand interconnect.

In the session we will present the test results and performance benefits of the UCX machine layer, as well as discuss the potential use cases of this component.