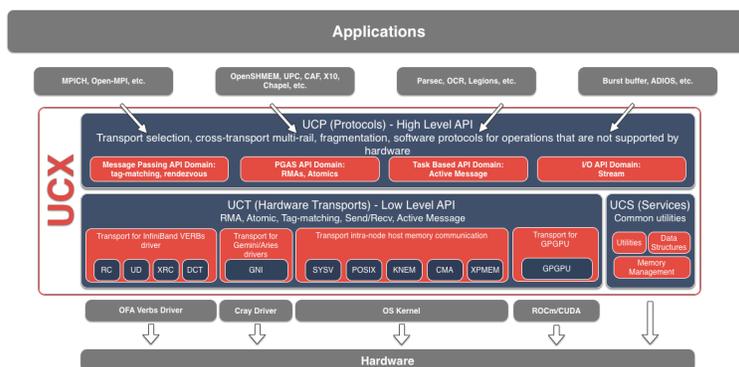


UCX: Unified Communication Layer X Software Release Version 1.2

Achievement: This is the first stable release of UCX, a low-level communication library for parallel programming models. This release supports MPI, OpenSHMEM, and task-based programming models, and currently used by Open MPI, MPICH, OpenSHMEM-X and PARSec on a wide variety of architectures including InfiniBand, Gemini/Aries, Ethernet, and Shared Memory.

Significance and Impact: UCX is developed and used by various institutions including ORNL, Mellanox, ARM, AMD, ANL, and LANL. It is used by traditional programming models such as MPI and OpenSHMEM, as well as emerging models such as Task-based Models and SharP for achieving low-latency, high-bandwidth and high-throughput communication.



Research Details:

UCX is a low-level communication library for parallel programming models. The various components of an UCX implementation is shown in the figure. It has two layers: high-level UCP layer and low-level UCT layer. The UCT layer is a simple data-transfer layer over a single network. The UCP layer abstracts UCT and provides additional functionality required by the parallel programming models. The important among them is support for wire-up, transport protocols optimized for various data sizes and types, support for multiple network interfaces, and additional network functionality missing in the hardware while required by a majority of parallel programming models. Some of the key characteristics of UCX:

- Achieves high-performance, scalability, and portability, which is a consequence of high-quality software engineering, and application-driven library design.
- Achieves usability across programming models and portability across architectures by using a two-layered (UCP and UCT) approach
- With modular and two-layered approach, the design enables easier support for implementing and porting UCX to new architectures and programming models.

Release Highlights

Supported platforms: Shared Memory, InfiniBand, Gemini, Aries, x86_64, ARMv8 (64bit), Power64
Functionality Added/Updated: Support for InfiniBand DC and UD transports, including accelerated verbs for Mellanox devices; support for PGAS/SHMEM interfaces; support for MPI tag matching; flow control for InfiniBand's RC/DC; and thread-safe invocation of functions.

Sponsor/Facility: DOD

Team: Manjunath Gorentla Venkata, Matthew Baker, Swen Boehm, Neena Imam, and Barney Maccabe – CSMD, Oak Ridge National Laboratory

Publication: NA