

# Applications (HPC, AI, ML, BigData)

MPICH, Open-MPI, etc.

OpenSHMEM, UPC, CAF, X10,  
Chapel, etc.

Parsec, OCR, Legions, etc.

Burst buffer, ADIOS, etc.

UCX

## UCP (Protocols) - High Level API

Transport selection, cross-transport multi-rail, fragmentation, software protocols for operations that are not supported by hardware

Message Passing API Domain:  
tag-matching, rendezvous

PGAS API Domain:  
RMAs, Atomics

Task Based API Domain:  
Active Message

I/O API Domain:  
Stream

## UCT (Hardware Transports) - Low Level API

RMA, Atomic, Tag-matching, Send/Recv, Active Message

Transport for InfiniBand VERBs  
driver

RC

UD

XRC

DCT

Transport for Gemini/Aries  
drivers

GNI

Transport intra-node host memory communication

SYSV

POSIX

KNEM

CMA

XPMM

Transport for  
GPGPU

GPGPU  
NVIDIA CUDA  
AMD ROCm

## UCS (Services)

Common utilities

Utilities

Data  
Structures

Memory  
Management

## UCM Memory Services

Memory  
Hooks

OFA Verbs Driver

Cray Driver

OS Kernel

ROCm/CUDA

Hardware