MVAPICH

MPI, PGAS and Hybrid MPI+PGAS Library

HPC and Cloud Convergence: What about HPC and Edge?

Panel at HPBDC '19

by

Dhabaleswar K. (DK) Panda

The Ohio State University

E-mail: panda@cse.ohio-state.edu

http://www.cse.ohio-state.edu/~panda

My Perspectives

- Based on
  - Programming Models
    - Message Passing Interface (MPI)
  - Networking Technologies
  - HPC
  - Deep Learning
  - Big Data

Questions

- What and where is the edge? Edge Computing is a recent term, and “edge” means different things in different contexts, to different people. What does it mean to you?
- Applications? Distinct and siloed, or are there any cross-cutting workloads? What could be the “Killer App”? In general, and from HPC/DoE perspective. Would the HPC/DoE edge applications vs. the commercial enterprise/cloud ones require similar functionality from their software stacks, or are there completely different tradeoffs in the design or implementation space?
- Bridging technologies? Thinking back about the rise of cloud computing, what do you think are some of the critical technologies that emerged from that space that triggered the bridging between enterprise/datacenter world and HPC? Do you think there is a similar trigger (waiting to happen) in terms of Edge Computing with respect to software or hardware technologies?

Meaning of Edge

- Processing Platform nearer to
  - End Users
  - Sensors
  - Instruments
  - Vehicles
- Performs computation with acquired data in real-time
- May not store the original data completely
- May need to store some % of data
- Computation is a part of a larger framework/workflow

Questions

- What and where is the edge? Edge Computing is a recent term, and “edge” means different things in different contexts, to different people. What does it mean to you?
- Applications? Distinct and siloed, or are there any cross-cutting workloads? What could be the “Killer App”? In general, and from HPC/DoE perspective. Would the HPC/DoE edge applications vs. the commercial enterprise/cloud ones require similar functionality from their software stacks, or are there completely different tradeoffs in the design or implementation space?
- Bridging technologies? Thinking back about the rise of cloud computing, what do you think are some of the critical technologies that emerged from that space that triggered the bridging between enterprise/datacenter world and HPC? Do you think there is a similar trigger (waiting to happen) in terms of Edge Computing with respect to software or hardware technologies?

Applications

- Quite Diverse
  - Speech
  - Image
  - Data (multi-dimensional)
- May have some similar operations across different application domains
  - Filtering
  - Compression
  - Basic DL/ML schemes
- Customized operations based on application domains

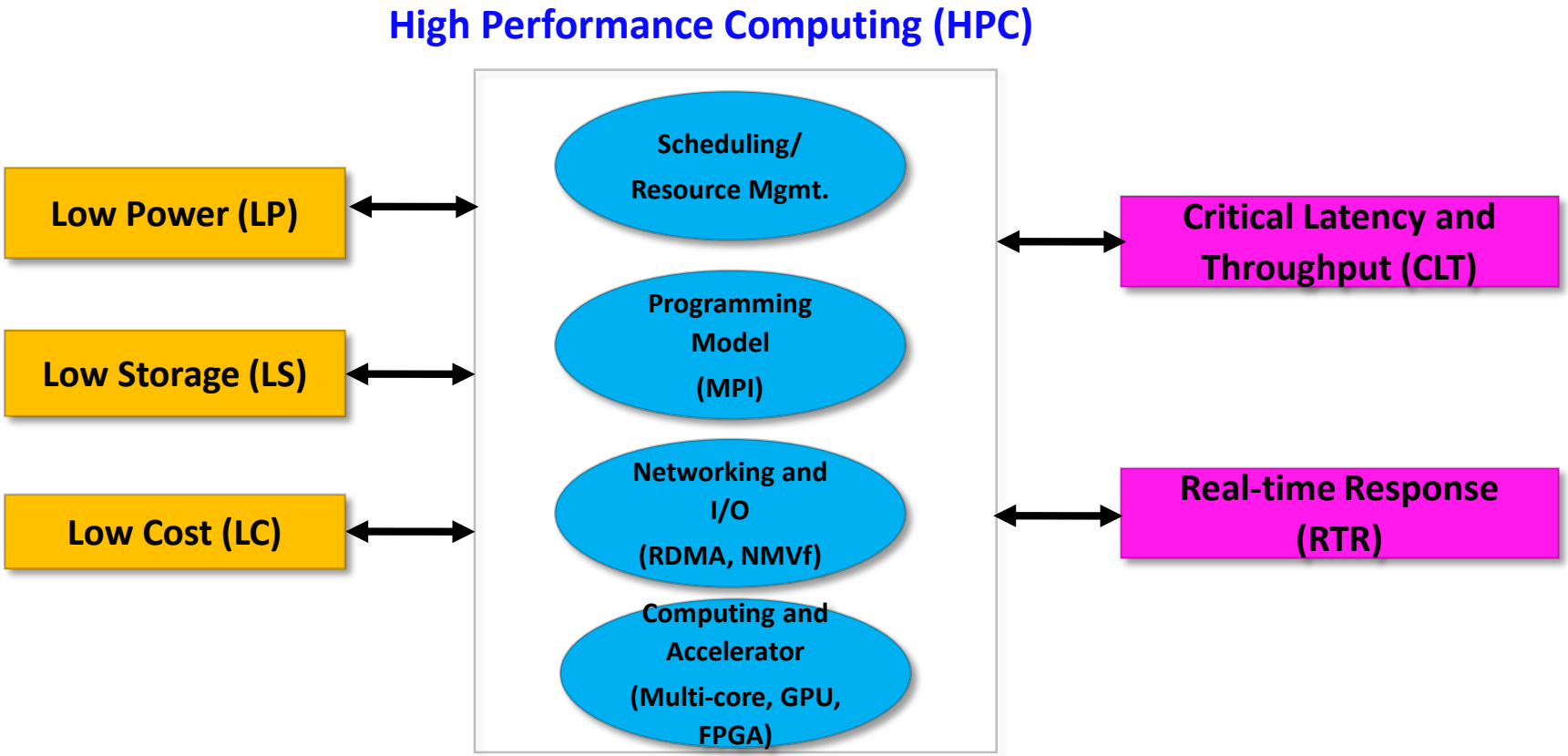
DOE vs. Cloud: Similarities and Differences

- HPC paradigms are similar
  - Processing
  - Communication
  - I/O
- However, edge systems have unique requirements
  - Low Power (LP)
  - Low Storage (LS)
  - Low Cost (LC)
  - Critical Latency and Throughput (CLT)
  - Real-time Response (RTR)

Questions

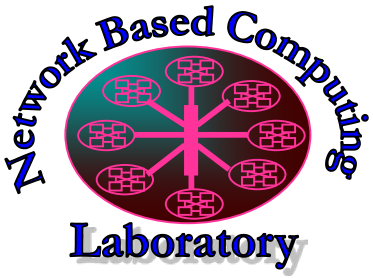
- What and where is the edge? Edge Computing is a recent term, and “edge” means different things in different contexts, to different people. What does it mean to you?
- Applications? Distinct and siloed, or are there any cross-cutting workloads? What could be the “Killer App”? In general, and from HPC/DoE perspective. Would the HPC/DoE edge applications vs. the commercial enterprise/cloud ones require similar functionality from their software stacks, or are there completely different tradeoffs in the design or implementation space?
- Bridging technologies? Thinking back about the rise of cloud computing, what do you think are some of the critical technologies that emerged from that space that triggered the bridging between enterprise/datacenter world and HPC? Do you think there is a similar trigger (waiting to happen) in terms of Edge Computing with respect to software or hardware technologies?

Bridging Technologies (Hardware and Software Co-design)



Thank You!

panda@cse.ohio-state.edu



Network-Based Computing Laboratory
http://nowlab.cse.ohio-state.edu/

The High-Performance MPI/PGAS Project
http://mvapich.cse.ohio-state.edu/

The High-Performance Big Data Project
http://hibd.cse.ohio-state.edu/

The High-Performance Deep Learning Project
http://hidl.cse.ohio-state.edu/