APPROVED FOR PUBLIC RELEASE; DISTRIBUTION IS UNLIMITED

Emerging Computing Architectures

U.S. ARMY RDECOM

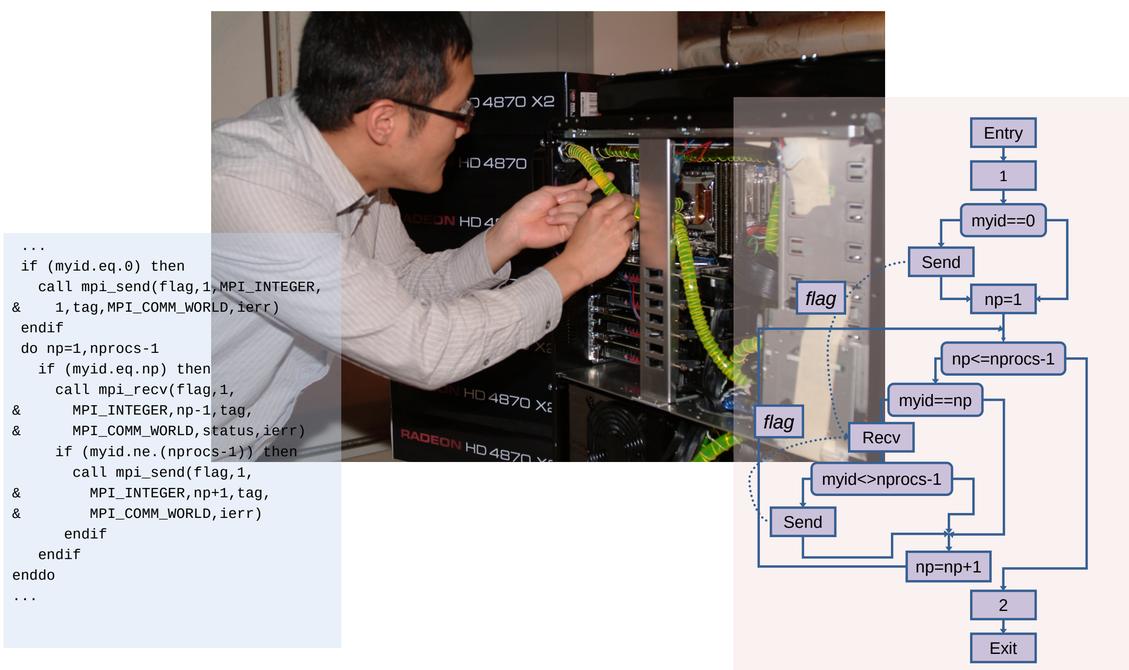
ARL open campus

S&T Campaign: Computational Sciences
Advanced Computing Architectures

Dale Shires and Song Park, (410) 278-5006
dale.r.shires.civ@mail.mil
song.j.park.civ@mail.mil

Research Objective

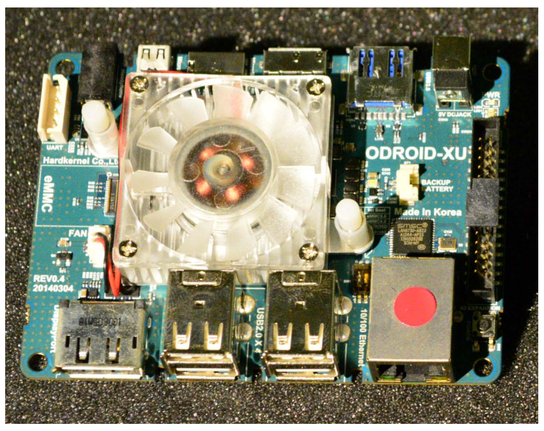
- Develop novel algorithms and methodologies to exploit pervasive parallelism in evolving architectures
- Discover novel ways to develop models and algorithms targeting emerging architectures such as neuro-synaptic and quantum annealing



Novel methods are needed to exploit emerging computing capacity

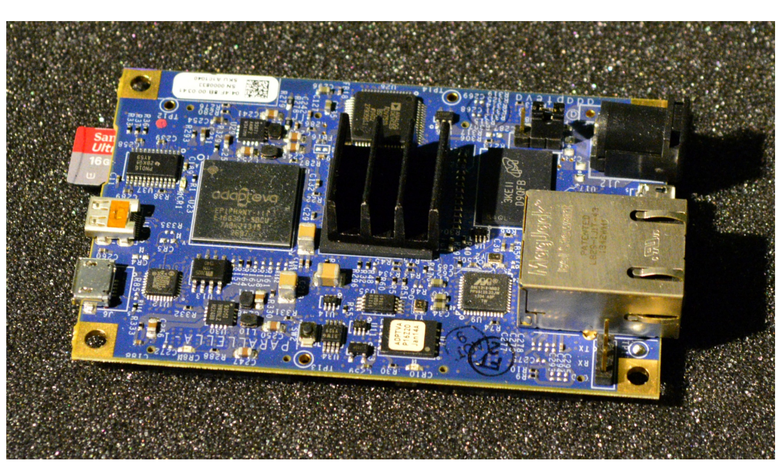
Challenges

- Gap between hardware capability and software utility
- Quantum algorithm development with weak programming models and descriptive environments
- Lack of dynamic code re-factoring for unknown processor capacity determined at run-times



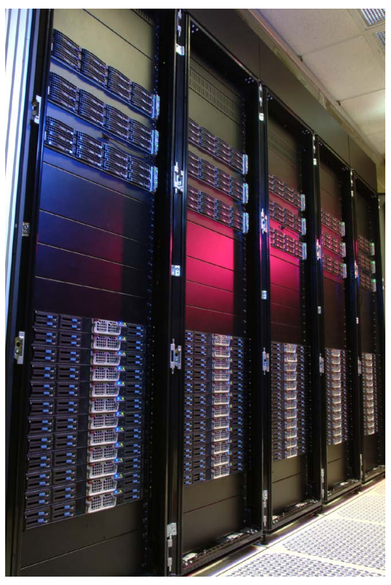
ODROID big.LITTLE processor configuration for high performance and low power

Epiphany 64-core processor technology

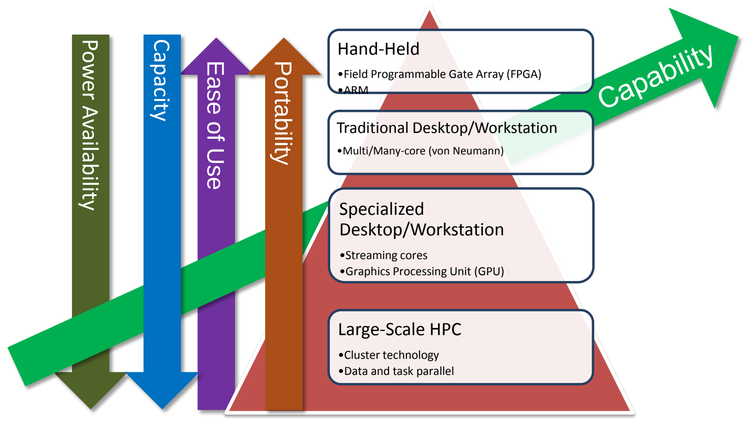


ARL Facilities and Capabilities Available to Support Collaborative Research

- Novel low-power architecture testbeds (ODROID big.LITTLE, Epiphany, Calxeda), large-scale heterogeneous systems (GPU-based))
- Large-scale heterogeneous resources including Xeon Phi and GPU clusters



Large-scale GPU-CPU heterogeneous clusters



Complementary Expertise/ Facilities/ Capabilities Sought in Collaboration

- Neuro-synaptic hardware and emulation models for feasibility studies
- Quantum annealing computing cycles on adiabatic systems (D-Wave)
- Machine learning expertise for large-scale Army application investigation and transition

APPROVED FOR PUBLIC RELEASE; DISTRIBUTION IS UNLIMITED