

DECARD, a Distributed Runtime for Heterogeneous Architectures



CAPSL

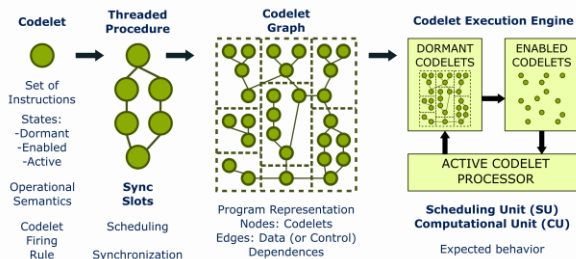
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Motivation and Introduction

The **Codelet Model** is a data-centric Program Execution Model (PXM) that describes simple yet sufficient mechanisms to handle computation and control signals required for **parallel computation**.

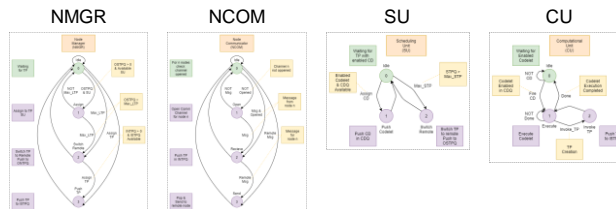
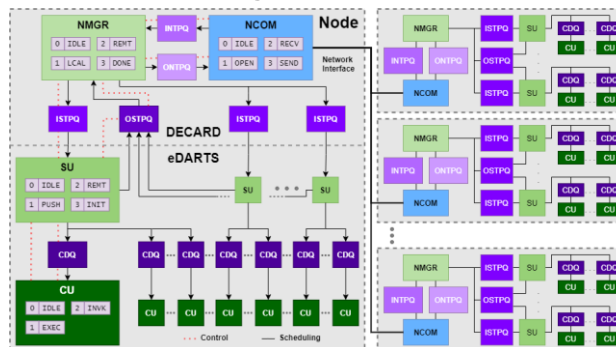


Heterogeneous Computation involves the usage of a combination of CPUs, GPUs, FPGAs or ASICs aiming to improve the performance of applications running on these computers.

The data-centric nature of **dataflow models for computation** provides a framework to dynamically and asynchronously manage the program's parallel execution based on the data's availability.

Methodology

Finite State Machines (FSM) and protocols define the behavior of the functional units that enable **workload scheduling**, **node-to-node communications**, and execution **monitoring** to make **runtime decisions**.



Findings and Conclusions

We have achieved a functional implementation of the proposed model using C/C++, OpenMP, and MPI, **proving the feasibility of using dataflow models for computation**. The units specified behavior and operation is sufficient to handle **asynchronous communication and workload balancing** between multiple nodes as well as within the node.

Simple kernels are used as payloads to test the scheduling mechanisms, communication protocols and workload execution.

Once the program has been executed, the **runtime's behavior** and overall communications between the functional units involved can be visualized for debugging and profiling.

