Continuous MapReduce on Heterogeneous Parallel Hardware for Stream Processing

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- CPUs and GPUs are abstracted away into Nodes. They implement the Node’s processData function which calls the appropriate code.
- Nodes asynchronously consume data from the Scheduler as they are able for any workflow operation.
- Fast Nodes consume more than slow or externally burdened Nodes.

C-MR Architecture

Maintaining Stream Order

- Nodes process data as they are received and place the results into the workflow buffer.
- As a node receives a punctuation on the input, it is replicated to the other nodes.
- Once all replicated punctuations are received, then the corresponding window is formed.

Expanded Workflow w/ Combine

- Combine enables incremental processing while reducing redundant computations.
- Combine sub-windows can be shared across overlapping Reduce windows and operators.

Operator Scheduling

Hybrid Scheduling Policy

- Nodes request data through the scheduler which can assign data from any operator in the workflow.
- The scheduler can enact different scheduling policies for each request.
- Our hybrid policy transitions between latency and memory oriented policies as we approach running into swap space.