Streaming and Parallel Dataflow Execution

- Data Intensive Computing.
- Requires low response time, up to (near) real-time analysis.
- MapReduce does not fit (batch system).
- New class of intra-node parallel streaming systems address this problem: e.g., Storm, S4, Muppet.

Input is a dataflow specified as directed acyclic graph (DAG):

Dataflow (called Topology in Storm) is executed in a parallel manner.

Batching in Streaming Systems

- Sending data tuple-by-tuple results in high network overhead.
- Tuple batching can increase throughput.

Key-based data distribution (w/o batching):

Novel batching schemas for intra-node parallelism:

Cost Model for Batch Size and Degree of Parallelism

Optimizing Batch Size: (batching reduces network overhead; n is shared over multiple payloads)

Optimizing Degree of Parallelism (dop): (increasing dop reduces load on single node)

Evaluation

Example Topologies

Linear Road: (in braces: dop/batchSize)

Sentiment Analysis: (in braces: dop/batchSize)