WSPPD Presentation

A Pre-Aggregation Strategy Towards Reduction on Job Completion Time in Stream Process Systems

Breno Fanchiotti Zanchetta - 00240494
Paulo R. Souza Jr, Kassiano J. Matteussi, Vinícius P. Perego
Julio C. S. Anjos, Claudio F. R. Geyer, Edison P. de Freitas

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Context

Big Data

↓

Stream

↓

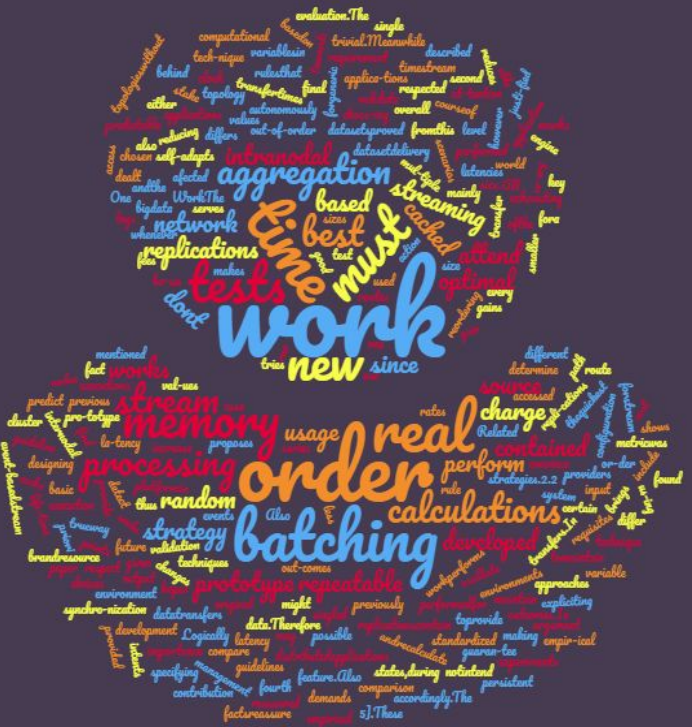
Stream Processing

One tuple-at-a-time

X

Aggregating tuples (batching)

Tool: Apache Flink -> Window



Aggregation

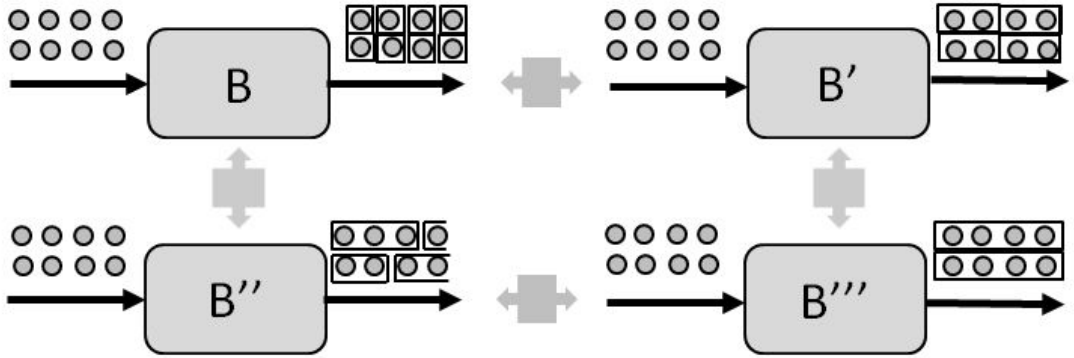
Static value is configured before experiments (Python Node).

For every input stream:

For every N aggregations:

Aggregate the Stream

Send Aggregation



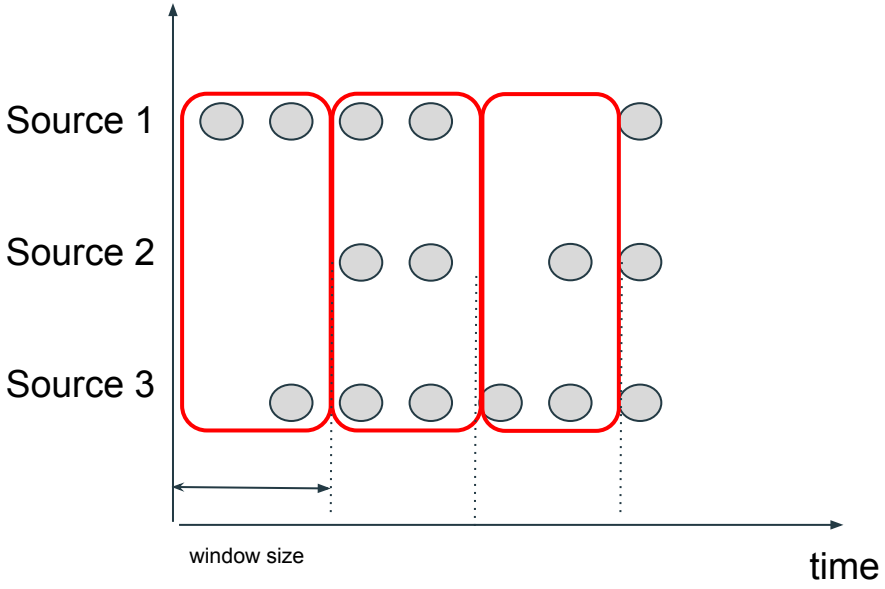
Window

Streaming engine tool.

Set by a time or size variable.

Has different subtypes: Tumbling x Sliding.

‘’Buckets’’ that apply computation.



Research Question

Is there an optimal value -- or group of values -- for batching technique that reduces Flink's Processing time?

Metric: Aggregation size x Flink's time

Model

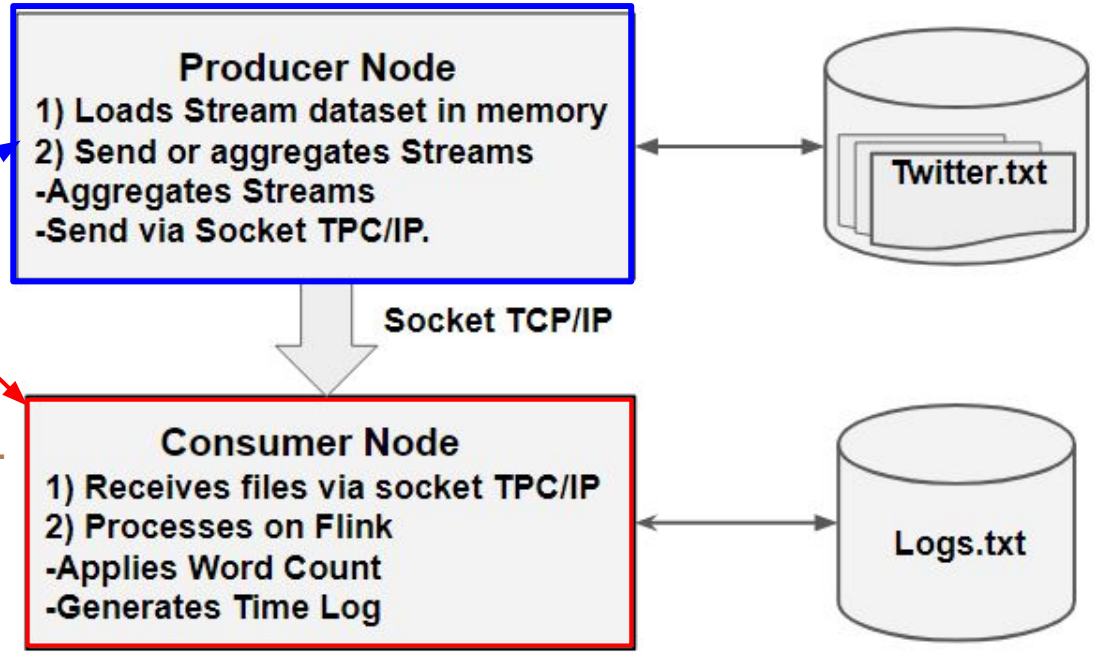
Prototype contains Python and Flink.

Python node aggregates streams.

Flink node consumes Aggregation.

Logs with time are generated.

Compares: Aggregation size x time logs.



Experiments

33 repetitions of each test , different aggregation sizes, 5 second window or not

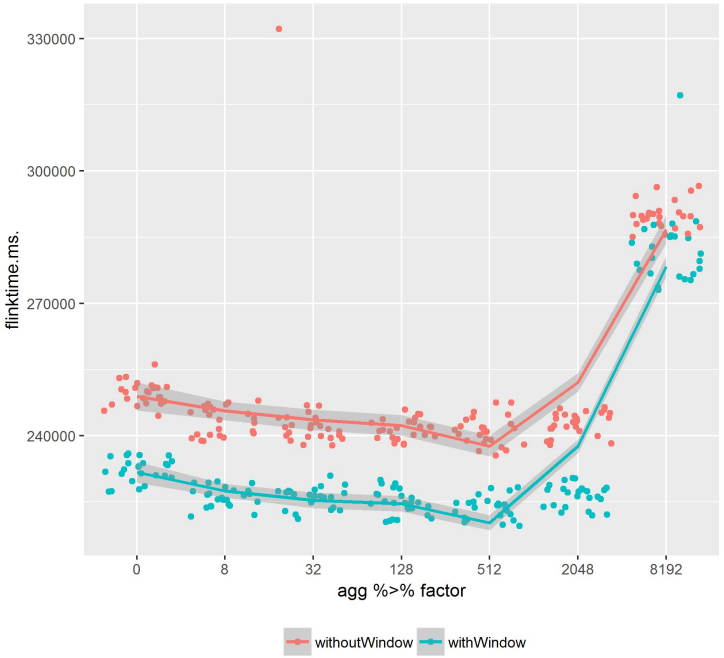
6 strategies of aggregation, 2 datasets, 2 types of window.
had 6x2x2=24 possibilities, 33 experiments for each configuration (so 24x33=792 total).

Tests executed on private Cluster: 5x Power Edge 1950
8 Cores (4 Real and 4 Virtual) - 16GB of RAM
Ubuntu Server version 16.04 LTS.

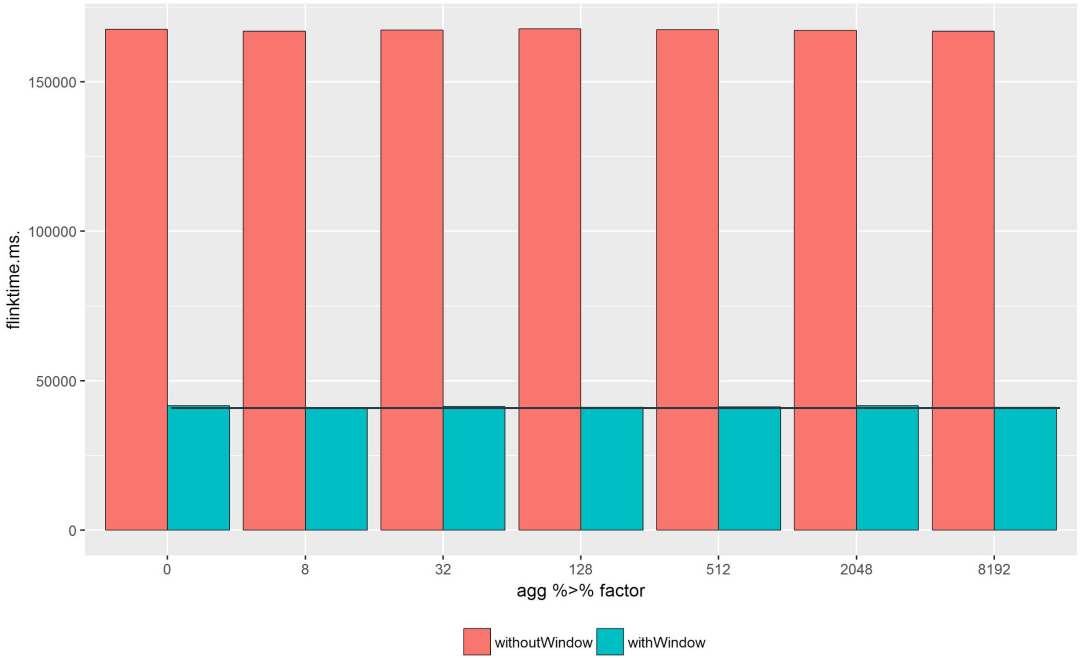
LAN Network bandwidth of 100 Mbps.

Results

Large Datasets - up to 5,806% gains (Windowed)



Small Datasets - no significant gains.



Conclusions and Future Works

Window is always good for performance. Batching is not very significant for small sized datasets, however demonstrates performance gain in big datasets (e.g. high input flow for a long time).

Future works will add latency and throughput as new metrics and further develop the prototype so it might be able to perform dynamic readjustment of aggregation.

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Thanks!

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