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A Performance Evaluation of Apache Kafka in Support of Big Data Streaming Applications

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1. Context
• Stream computing: a new paradigm enabling real-time Big Data processing through 3 steps
  • Ingestion: Apache Kafka
  • Processing: Apache Spark / Flink
  • Storage: HDFS, Cassandra

• Ingestion can be a bottleneck for stream processing

2. Contribution
• Identify the impact of different parameter settings on Kafka's overall performance
• Experiment evaluation of several configurations and performance metrics of Kafka
• Allow users to avoid bottlenecks and achieve good practice for stream processing

3. Kafka Architecture

4. Methodology
• Isolate the performance of each Kafka component
• Separated tests for Producers and Consumers
• Make correlations between configuration parameters, resource usage and performance metrics
• Experiments executed on Grid5000
  • Up to 32 nodes (16 cores per nodes, 28 GB RAM, 10 Gigabit Ethernet)

5. Results
Producer performances when modifying batch size for several number of nodes and a message size of 50B

6. Key metrics
Parameters:
• Message size
• Batch size
• Acquisition strategy
• Network and disk I/O threads
• Message replication
• Hardware

Performance Metrics:
• Throughput (MB/s, items/s)
• Latency
• CPU usage
• Disk usage
• Memory usage
• Network usage

7. Take-aways
• The variation of the batch size shows that there is a range of batches with a better performance.

• When varying the number of nodes in some scenarios: a sudden performance drop (probably due to the internal Kafka synchronizations as well as the underlying network).

• Future work: evaluating reference processing frameworks (Apache Spark and Flink)

Bibliographie / sources

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