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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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