Studi Performa Real-Time Data Streaming Platform Berbasis Apache Kafka pada Sistem Monitoring dan
Deteksi Anomali Pengeboran di PT Parama Data Unit
Amanda Farliana Setyasari, Dr. Eng. Ir. Ganjar Alfian, S.T., M.Eng.
Universitas Gadjah Mada, 2026 | Diunduh dari http://etd.repository.ugm.ac.id/

INTISARI

STUDI PERFORMA *REAL-TIME DATA STREAMING PLATFORM* BERBASIS APACHE KAFKA PADA SISTEM *MONITORING* DAN DETEKSI ANOMALI PENGEBORAN DI PT PARAMA DATA UNIT

Amanda Farliana Setyasari
22/499652/SV/21353

Industri pengeboran minyak dan gas bumi memiliki tingkat risiko operasional yang tinggi sehingga memerlukan sistem *monitoring* data secara *real-time* untuk mendeteksi kondisi anomali sejak dini. Penelitian ini bertujuan menganalisis performa Apache Kafka sebagai *real-time data streaming platform* pada sistem *monitoring* pengeboran di PT Parama Data Unit serta mengembangkan *web dashboard* untuk visualisasi data dan deteksi anomali. Fitur deteksi anomali bertujuan untuk memberikan peringatan ketika parameter pengeboran berada di luar kondisi normal. Penelitian dilakukan melalui pengembangan sistem berbasis Apache Kafka dan evaluasi performa menggunakan simulasi 362.822 data historis pengeboran. Evaluasi dilakukan pada variasi *partition* dan *message rate* menggunakan metrik *latency*, *throughput*, *message loss*, dan *resource usage*. Hasil pengujian menunjukkan konfigurasi delapan *partition* menghasilkan *latency persistence consumer* terendah sebesar 730 ms tanpa *message loss*, sedangkan sistem mampu mempertahankan *throughput* hingga mendekati 50.000 pesan per detik sebelum mencapai kondisi *throughput saturation*. Hasil *User Acceptance Test* menunjukkan tingkat penerimaan pengguna sebesar 88,5% dengan kategori sangat baik. Hasil penelitian menunjukkan Apache Kafka diharapkan mampu mendukung kebutuhan *real-time data streaming* pada sistem *monitoring* pengeboran serta meningkatkan keselamatan kerja dan efisiensi operasional di sektor minyak dan gas bumi.

Kata kunci: Apache Kafka, *Real-Time Data Streaming*, Sistem *Monitoring* Pengeboran, Deteksi Anomali

UNIVERSITAS
GADJAH MADA
**Studi Performa Real-Time Data Streaming Platform Berbasis Apache Kafka pada Sistem Monitoring dan
Deteksi Anomali Pengeboran di PT Parama Data Unit**
Amanda Farliana Setyasari, Dr. Eng. Ir. Ganjar Alfian, S.T., M.Eng.
Universitas Gadjah Mada, 2026 | Diunduh dari http://etd.repository.ugm.ac.id/

ABSTRACT

PERFORMANCE EVALUATION OF AN APACHE KAFKA-BASED REAL-TIME DATA STREAMING PLATFORM FOR DRILLING MONITORING AND ANOMALY DETECTION AT PT PARAMA DATA UNIT

Amanda Farliana Setyasari
22/499652/SV/21353

The oil and gas drilling industry has a high level of operational risk, requiring a real-time monitoring system to detect anomalous conditions at an early stage. This study aims to analyze the performance of Apache Kafka as a real-time data streaming platform for a drilling monitoring system at PT Parama Data Unit and to develop a web dashboard for real-time data visualization and anomaly detection. The anomaly detection feature is designed to provide alerts when drilling parameters exceed predefined normal thresholds. The study was conducted by developing an Apache Kafka-based system and evaluating its performance using a simulation based on 362,822 historical drilling data records. Performance evaluation was carried out under varying partition counts and message rates using latency, throughput, message loss, and resource usage as evaluation metrics. The results show that a configuration with eight partitions achieved the lowest persistence consumer latency of 730 ms without message loss, while the system maintained a throughput of nearly 50,000 messages per second before reaching throughput saturation. The User Acceptance Test results indicate a user acceptance score of 88.5%, categorized as very good. The findings suggest that Apache Kafka is expected to support real-time data streaming requirements in drilling monitoring systems while improving operational safety and efficiency in the oil and gas industry.

Keyword: Apache Kafka, Real-Time Data Streaming Drilling Monitoring System, Anomaly Detection