

ABSTRAK

Di Perusahaan Daerah Air Minum (PDAM) Bangkalan, belum ada sistem informasi pemantauan reservoir atau *backbone real-time*. Oleh karena itu, diperlukan pengembangan sistem pemantauan berbasis IoT dengan *backbone real-time* yang mampu memberikan data akurat untuk pengambilan keputusan operasional sehingga sejalan dengan pencapaian *Sustainable Development Goals* (SDGs) tentang *industry, innovation and infrastucture*. Namun, dalam pengembangan sistem, sering ditemui kendala optimalisasi kinerja akibat fluktuasi sehingga dapat terjadi masalah seperti *data loss* dan keterlambatan pengiriman data. Penelitian ini bertujuan mengoptimasi faktor yang memengaruhi kinerja sistem pemantauan reservoir PDAM Bangkalan dengan metode eksperimen Taguchi L9 GRA (*Grey Relational Analysis*), yang efektif menangani banyak respon seperti *latency, data loss, throughput, freshness* dan *CPU/RAM usage* agar menghasilkan konfigurasi faktor optimal yang memastikan kestabilan dan akurasi *backbone real-time*. Hasil penelitian menunjukkan bahwa faktor *payload size*, dan *database batch size* berpengaruh signifikan terhadap kinerja sistem dengan nilai *p-value* masing-masing 0,024 dan 0,028 ($<0,05$). Kontribusi terbesar diberikan oleh *payload size* sebesar 48%, diikuti *database batch size* sebesar 41%, dan *subscriber count* sebesar 10%. Kombinasi faktor optimal diperoleh pada *payload size* 256 byte, *subscriber count* 3, dan *database batch size* 10. Hasil eksperimen konfirmasi menunjukkan kombinasi optimal valid dan menghasilkan kinerja yang memenuhi standar TIPHON kategori baik hingga sangat baik, sehingga direkomendasikan sebagai konfigurasi backbone data real-time untuk pemantauan reservoir PDAM Bangkalan.

Kata kunci : *Backbone real-time*, pemantauan reservoir, Taguchi L9 GRA, konfigurasi optimal.

ABSTRACT

At the Bangkalan Regional Water Supply Company (PDAM), there is currently no reservoir monitoring information system or real-time backbone. Therefore, there is a need to develop an IoT-based monitoring system with a real-time backbone capable of providing accurate data for operational decision-making, thereby aligning with the Sustainable Development Goals (SDGs) regarding industry, innovation, and infrastructure. However, during system development, performance optimization challenges often arise due to fluctuations, which can lead to issues such as data loss and delayed data transmission. This study aims to optimize the factors affecting the performance of the Bangkalan PDAM reservoir monitoring system using the Taguchi L9 GRA (Grey Relational Analysis) experimental method, which effectively handles multiple responses such as latency, data loss, throughput, freshness, and CPU/RAM usage to produce an optimal factor configuration that ensures the stability and accuracy of the real-time backbone. The results show that payload size, and database batch size significantly affect system performance with p-values of 0.024 and 0.028, respectively (<0.05). Payload size contributes the most at 48%, followed by database batch size at 41%, and subscriber count at 10%. The optimal combination of factors was obtained with a payload size of 256 bytes, a subscriber count of 3, and a database batch size of 10. The results of the validation experiments indicate that the optimal combination is valid and delivers performance that meets TIPHON standards in the good to very good categories; therefore, it is recommended as the real-time data backbone configuration for reservoir monitoring at PDAM Bangkalan.

Keywords: Real-time backbone, reservoir monitoring, Taguchi L9 GRA, optimal configuration.