ABSTRACT

Indonesia is situated between three major tectonic plates: the Indo-Australian Plate, the Eurasian Plate, and the Pacific Plate. Due to this geographical setting, Indonesia is prone to natural disasters such as earthquakes and tsunamis. To mitigate these risks, the Meteorology, Climatology, and Geophysics Agency (BMKG) utilizes a tsunami early warning system known as the Indonesia Tsunami Early Warning System (InaTEWS) along with the SeisComP software. InaTEWS operates to quickly alert the public when there is a potential tsunami. This system is the result of collaboration between Indonesia and Germany, with BMKG taking the primary responsibility for its development since its handover on July 7, 2011. In an era of continuously evolving technology, artificial intelligence (AI) has become a key element in enhancing tsunami early warning systems. However, SeisComP has not yet implemented AI in the transmission of seismic waves. The use of AI enables the development of more sophisticated and accurate systems. One approach taken in this research is the development of a tsunami early warning system. This system is divided into two parts: backend and frontend. The main focus of this research is to develop the TEWS software backend with the implementation of message brokers, WebSocket, microservices architecture, and the ICONIX Process methodology. Consequently, the TEWS software backend developed in this research can serve as a concept for further TEWS software development by BMKG. This backend software has undergone a series of tests, including system and performance testing. From these evaluations, the system testing successfully met all set test scenarios. Additionally, performance testing was conducted to assess the performance of the TEWS software backend based on the number of different seismic stations, ranging from 5 to 500. The performance tests showed that data throughput increased with the number of stations, while process times ranged between 0.3 and 5 seconds. Through the integration of AI technology with TEWS software, it is expected to provide accurate and timely early warnings to the public.

Keywords : *Tsunami Early Warning System (TEWS),* Kecerdasan buatan, *ICONIX Process, message broker, webSocket, dan microservices architecture.*