ABSTRACT

Indonesia is a country bordered by three major tectonic plates: the Indo-Australian Plate, the Eurasian Plate, and the Pacific Plate. This geographic positioning makes Indonesia highly susceptible to natural disasters such as tsunamis and earthquakes. To mitigate the impact of tsunamis, the Tsunami Early Warning System (TEWS) is recognized as the most effective method for estimating the potential of tsunamis and providing early warnings to the public. Indonesia began developing the TEWS through a collaborative program with Germany, leading to the formation of the Indonesia Tsunami Early Warning System (InaTEWS), which was officially handed over on July 7, 2011, with the Meteorological, Climatological, and Geophysical Agency (BMKG) responsible for maintaining the system. With the advancement of technology, there is a continuous need for innovation, especially in applying cutting-edge technology such as artificial intelligence, to produce more accurate warning systems. Therefore, the development of a real-time earthquake and tsunami monitoring application based on web technology that implements artificial intelligence is necessary. The web-based application development in this study is divided into two developers: front-end and back-end. This research focuses on the development of the back-end module of the real-time TEWS software, developed by applying a message broker, Websocket, event-driven architecture (EDA), and the *ICONIX* Process method. The *ICONIX* Process method produces a back-end module of the web-based TEWS software, which in its design and implementation process applies a message broker, Websocket, and EDA. The developed back-end module of the TEWS software can become one of the concepts for the development of TEWS software currently being pursued by BMKG. The back-end module of the TEWS software has been evaluated through black box testing and non-functional testing. From this evaluation, the black box testing successfully met all tests from 71 test cases. Additionally, non-functional testing was conducted to determine the throughput and response time produced by the TEWS back-end module, adjusted for a range of seismic stations generating data with ranges of 5, 50, 100, and 500 stations. The results of the non-functional testing showed a throughput value that increased with the number of stations, and a response time range between 1,1762 second and 1,1856 second.

Keywords : TEWS, *Real-time, ICONIX* Process, *webSocket,* and EDA