World Academy of Science, Engineering and Technology
International Journal of Computer and Information Engineering
Vol:16, No:08, 2022

Design of an Improved Distributed Framework for Intrusion Detection System Based on Artificial Immune System and Neural Network

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Abstract : Intrusion detection refers to monitoring the actions of internal and external intruders on the system and detecting the behaviours that violate security policies in real-time. In intrusion detection, there has been much discussion about the application of neural network technology and artificial immune system (AIS). However, many solutions use static methods (signature-based and stateful protocol analysis) or centralized intrusion detection systems (CIDS), which are unsuitable for real-time intrusion detection systems that need to process large amounts of data and detect unknown intrusions. This article proposes a framework for a distributed intrusion detection system (DIDS) with multi-agents based on the concept of AIS and neural network technology to detect anomalies and intrusions. In this framework, multiple agents are assigned to each host and work together, improving the system's detection efficiency and robustness. The trainer agent in the central server of the framework uses the artificial neural network (ANN) rather than the negative selection algorithm of AIS to generate mature detectors. Mature detectors can distinguish between self-files and non-self-files after learning. Our analyzer agents use genetic algorithms to generate memory cell detectors. This kind of detector will effectively reduce false positive and false negative errors and act quickly on known intrusions.

Keywords : artificial immune system, distributed artificial intelligence, multi-agent, intrusion detection system, neural network
Conference Title : ICIST 2022 : International Conference on Information Systems and Technologies
Conference Location : Vancouver, Canada
Conference Dates : August 08-09, 2022