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Double Layer Security Authentication Model for Automatic Dependent Surveillance-Broadcast

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Abstract : An automatic dependent surveillance-broadcast (ADS-B) system has serious security problems. In this study, a double layer authentication scheme between the aircraft and ground station, aircraft to aircraft, ground station to ATC tower is designed to prevent any unauthorized aircrafts from introducing themselves as friends. This method can be used as a solution to the problem of authentication. The method is a combination of classical cryptographic methods and new generation physical layers. The first layer has employed the embedded key of the aircraft. The embedded key is assumed to installed during the construction of the utility. The other layer is a physical attribute (flight path, distance, etc.) between the aircraft and the ATC tower. We create a mathematical model so that two layers' information is employed and an aircraft is authenticated as a friend or unknown according to the accuracy of the results of the model. The results of the aircraft are compared with the results of the ATC tower and if the values found by the aircraft and ATC tower match within a certain error margin, we mark the aircraft as friend. As a result, the ADS-B messages coming from this authenticated friendly aircraft will be processed. In this method, even if the embedded key is captured by the unknown aircraft, without the information of the second layer, the unknown aircraft can easily be determined. Overall, in this work, we present a reliable system by adding physical layer in the authentication process.

Keywords : ADS-B, authentication, communication with physical layer security, cryptography, identification friend or foe
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