

Efficient authentication and re-authentication protocols for 4G/5G heterogeneous networks

ABSTRACT

In the next-generation heterogeneous wireless networks, designing authentication protocols that meet the demand of mobile users/applications is a challenge. This paper proposes authentication and re-authentication protocols for 4G wireless networks, in particular, LTE-Advanced (LTE-A), WLAN, and WiMAX-Advanced (WiMAX-A) interworking architecture. The proposed protocols are applicable to 5G networks. With the consideration of the existing standard authentication protocols, a new set of authentication and re-authentication protocols has been reinvented to provide fast and secure handovers (HO) in the current 4G and the next 5G networks. The proposed authentication protocols can be invoked when the users perform a vertical HO (between different networks) for the first time, whereas the re-authentication protocols can be invoked when the users perform a horizontal HO (within the same network domain). These protocols provide an efficient method to protect user identity and reduce the burden on the authentication server (AS) during the sequential handovers. The results of the analytical model show that the proposed protocols achieve better performance than standard and other protocols. The reduction of handover cost, handover delay, and energy consumption in the proposed protocols reaches up to 22%, 44%, and 17%, respectively. In addition, the verification tools show that the proposed protocols are secure, dependable, and prevent all types of authentication and secrecy attacks.

Keyword: 5G; EAP-AKA authentication; Fast re-authentication; AVISPA