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DependData: data collection dependability through three-layer decision-making in BSNs for healthcare monitoring

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ABSTRACT

Recently, there have been extensive studies on applying security and privacy protocols in Body Sensor Networks (BSNs) for patient healthcare monitoring (BSN-Health). Though these protocols provide adequate security to data packets, the collected data may still be compromised at the time of acquisition and before aggregation/storage in the severely resource-constrained BSNs. This leads to data collection frameworks being meaningless or undependable, i.e., an undependable BSN-Health. We study data dependability concerns in the BSN-Health and propose a data dependability verification framework named DependData with the objective of verifying data dependability through the decision-making in three layers. The 1st decision-making (1-DM) layer verifies signal-level data at each health sensor of the BSN locally to guarantee that collected signals ready for processing and transmission are dependable so that undependable processing and transmission in the BSN can be avoided. The 2nd decision-making (2-DM) layer verifies data before aggregation at each local aggregator (like clusterhead) of the BSN to guarantee that data received for aggregation is dependable so that undependable data aggregation can be avoided. The 3rd decision-making (3-DM) layer verifies the stored data before the data appears to a remote healthcare data user to guarantee that data available to the owner end (such as smartphone) is dependable so that undependable information viewing can be avoided. Finally, we evaluate the performance of DependData through simulations regarding 1-DM, 2-DM, and 3-DM and show that up to 92% of data dependability concerns can be detected in the three layers. To the best of our knowledge, DependData would be the first framework to address data dependability aside from current substantial studies of security and privacy protocols. We believe the three layers decision-making framework would attract a wide range of applications in the future.

KEYWORDS

Body sensor networks; Healthcare monitoring; Decision-making; Dependability; Data dependability; Security and privacy; Data quality

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