INNOVATIVE APPROACHES TO ELUCIDATE OPTIMAL DEPLOYMENT OF CB SENSING ASSETS

A Modular System Architecture For Securely Acquiring, Transmitting, And Processing Data From Wireless Chem-bio Sensors

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Background. The ability to continuously monitor Soldier health and the ambient environment is critical for the early detection of chemical and biological threats. Wireless sensors that are wearable and portable can more accurately measure personal exposures compared to aggregated health records (e.g., the number of weekly flu cases for a given geographic area) and fixed monitoring stations (e.g., weather stations). Purpose. The data from wireless sensors must be securely transmitted to a central location to provide Leadership with an overview of current threats to Soldier health and Mission success. Most commercially available sensors use vendor resources (e.g., apps and cloud-based databases) to acquire, store, and process the data. These resources are not approved for sensitive military data and require an internet connection. Objective. Design a flexible system architecture that by-passes the sensor manufacturer's mobile and cloud-based resources by acquiring data directly from the sensor and securely transmitting it to a Government-approved location. The system architecture must be scalable to 1000+ sensors and work in resource-limited settings. Rationale. Mobile technology is rapidly evolving with new and more powerful health and environmental sensors constantly available. To remain current with technology trends and prevent vendor lock, mobile systems relying on data from wireless sensors must be modular and maintain similar performance across different hardware implementations. Methods. The Architecture for Localized Precision Health data Acquisition from Wearables (AlphaWear) acquires data directly from sensors and processes the data into actionable information. AlphaWear consists of three sub-components: a mobile SyncHub for acquiring data from wearable/wireless health and environmental sensors, a Storage and Analytics Node (SAN) for analyzing and storing data, and a dashboard for displaying threat status. Each sub-component is designed using a modular approach, allowing efficient addition of new sensors or upload destinations, and tested using procedures that follow industry best practices. Results. The SyncHub has been implemented using both iOS and Android mobile phones and tablets with up to five sensors syncing data to a single device. The SAN has been implemented on the AWS cloud (e.g., Two-Six Technologies DTECT platform) and on physical laptops (e.g., Panasonic TOUGHBOOK and Dell XPS 15s) and single-board computers (e.g., NVIDIA Jetson and Intel NUC). Data have been visualized using Grafana-based dashboards and on the ATAK. Conclusions & Impact. AlphaWear is a modular and configurable platform that can be implemented using a variety of sensor-SyncHub-SAN configurations. We have tested the platform with over 200 users during a multi-week international exercise and have simulated use with up to 500 sensors. Next steps involve testing AlphaWear with more end users who are operating under different resource constraints.

We would like to acknowledge the JPEO-CBRND Wearables Pilot program for funding. We would like to thank Bryan Rivers and Loren Hankla for stimulating conversation related to the AlphaWear platform.

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