

## INNOVATING CROSS-DOMAIN SOLUTIONS TO DETECT EMERGING BIOLOGICAL THREATS

# An Edge/cloud Wearable Technologies Data Infrastructure For Detecting Biological Threats And Physiological Stress

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Riskaware has been working with the Disease and Non-Battle Injury (DNBI) group at the Defence Science and Technology Laboratory (Dstl) to develop a Data Architecture and Mobile Application that can be used to upload and store physiological measurements recorded by Garmin smartwatches.

Early symptoms of sickness, or physiological stress can be indicators of potentially serious biological threats, as well as having an immediate detrimental impact on the performance of personnel. Hence, it is highly desirable to have a system for early identification of these, potentially before overt physical symptoms manifest.

The Mobile Application we have developed is cross-platform and can run on either iPhones or Android phones. The Data Architecture that has been developed to support centralisation and management of the collected data has been developed to run either on a standalone network (i.e. isolated from the wider internet), or in a cloud-based environment, using Amazon Web Services.

Data is synchronized directly from the Garmin watches using their Health SDK, which gives access to the raw data recorded by the watch's sensors. The Mobile Application that Riskaware has developed uploads metrics such as beat-to-beat interval (BBI), respiration rate, oxygen saturation and step count. The Data Architecture then processes and stores the data in a time-indexed structure to allow for efficient querying of the data. While the Mobile Application uploads the measurements that are applicable to these studies, the Data Architecture has been developed in a way that it is extensible to process any timestamped data that is uploaded.

The Data Architecture has a built-in administrator application which allows configuration of studies and visualisation of data. A study is created with a set of participants, each of which is assigned one or more wearable devices to be worn. The study is configured with the metrics that should be extracted from the uploaded data during the processing phase. The administrator application provides high-level statistics on the data that has been collected for a study and visualisations that study administrators can use to ensure that data is being collected and is within the expected range of values.

Dstl have analysed data collected from cohorts of study participants to attempt to identify patterns and indicators that predict that an individual is becoming sick. In addition to the collected data, daily symptom questionnaires are used to get feedback from participants on their general state of health throughout the study. If certain responses are received this may trigger the study team to take blood samples and other tests to identify any form of sickness.

Our presentation will provide an overview of the architecture that we have developed, and example summary visualisations of data collected.