PHASER: Physiological Health Assessment System for Emergency Responders

Maxim Batalin

Project Manager, PHASER

UCLA Wireless Health Institute

UCLA Institute for Technology Advancement

BAN Architecture in PHASER Deployments

First Responder Training

PHASER Fitness System

PHASER Web Services

First Responder On-scene

Wireless MicroLEAP
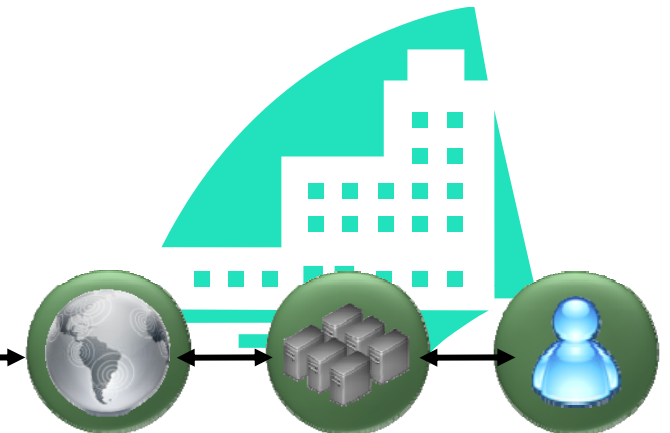
Zephyr Bioharness

Motion Sensors

Feedback/Guidance

PHASER Analytic Center

Tier 3
Body Area Network

Tier 2
Wide Area Wireless

Sensor records and events

Algorithms and device reconfiguration and intervention guidance

Tier 1
Network Infrastructure

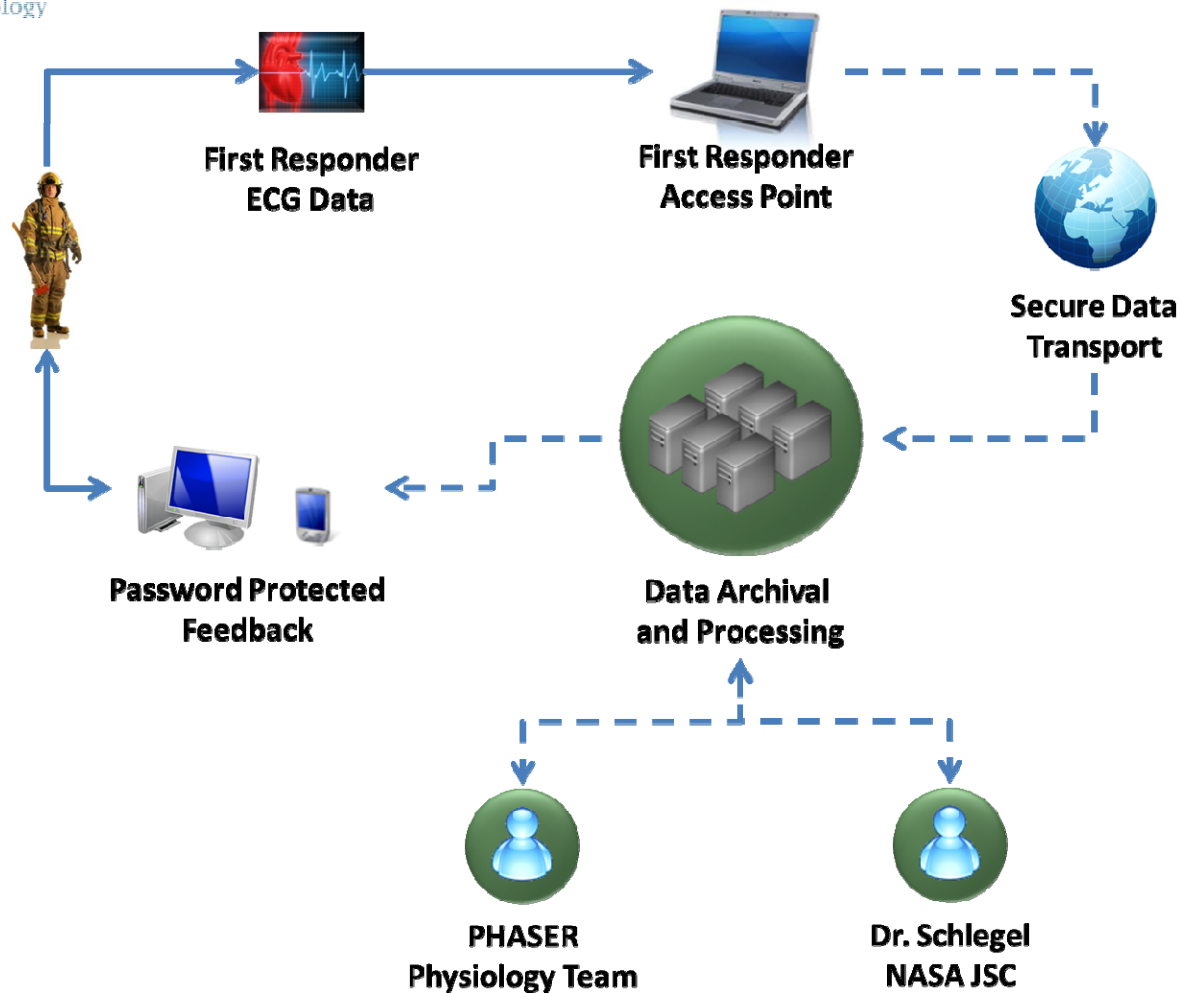Web Services

Data Archival

Data Analysis

BAN Systems in PHASER Deployments: NetFit

- Automated low-cost networked system:
  - Fitness assessment
  - Guidance and intervention
- BAN Technology:
  - State-of-the-art sensors (e.g. heart rate, motion)
  - Mobile phone for data collection and real-time feedback
- Main functionalities:
  - Determine workload from motion
  - Compute standard fitness measures: VO2max
  - Exploring novel fitness measures:
    - Chronotropic Index (CI)
    - Cardio-caloric index (CCI)
  - Enables fitness monitoring on treadmill or during outdoor walking/running exercise
  - Enables assessment and monitoring of strength
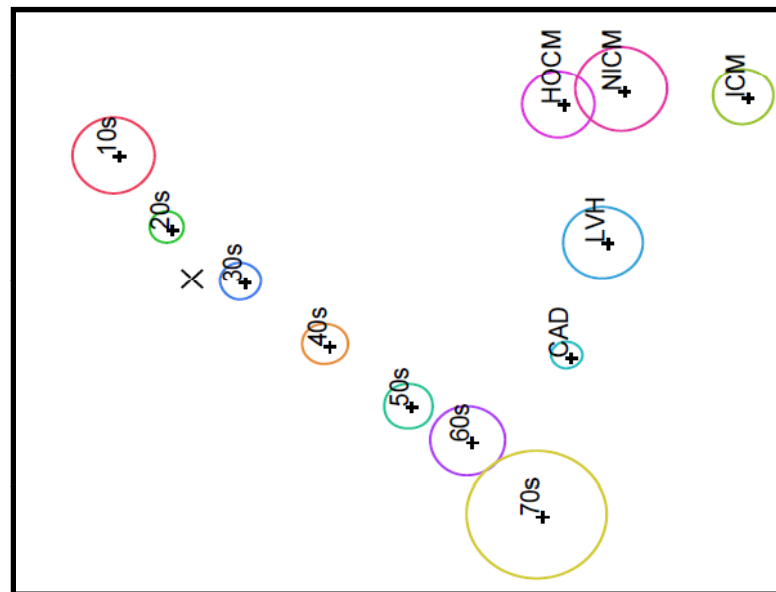 - Relies on PHASER Information Technology Infrastructure

BAN Systems in PHASER Deployments: Advanced ECG Validation

First Responder
ECG Data

First Responder
Access Point

Secure Data
Transport

Password Protected
Feedback

Data Archival
and Processing

PHASER
Physiology Team

Dr. Schlegel
NASA JSC

Collaborative work with NASA JSC (Dr. Schlegel)

Advanced ECG Validation: Examples of Feedback
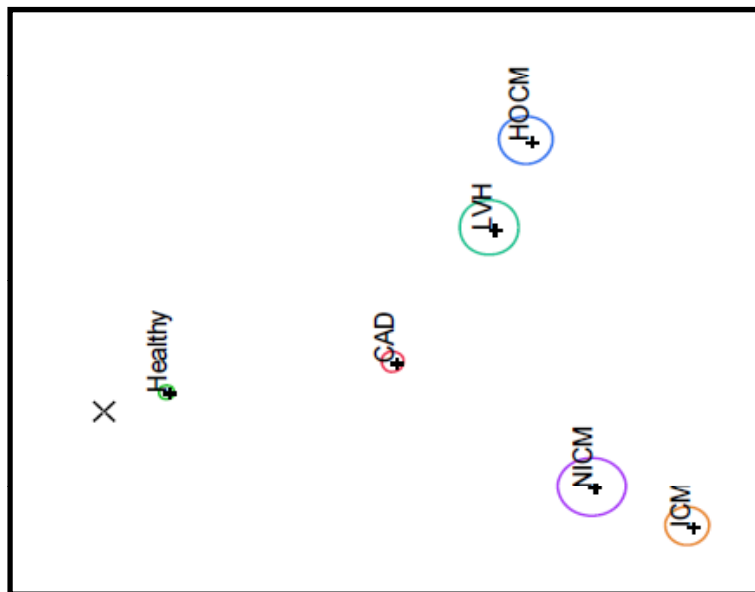
A-ECG SUPERSCORE(S) RESULTS:
Percent Similarity to:

Healthy Population:	>99%	Diseased Population: <1%

A-ECG SUPERSCORE(S) IMPRESSION:
A-ECG result most resembles that of a person with a confirmed or presumed healthy heart

*Examples extracted from reports generated by Dr. Schlegel

Validation of BAN Systems: PHASER Enterprise Testbed

- Critical requirement for assured system performance, integrity, and operating lifetime

- PHASER-ET is developed for Emergency Responders as the first infrastructure for standardized testing and evaluation of equipment

- PHASER Enterprise Testbed program includes end-to-end evaluation capability with Mobile Testbed

- Provides access to data and open source platform to be distributed to the industry and research community

Validation of BAN Systems: PHASER Mobile Testbed

- Testing and validation of technology:
  - Communication (WAN and BAN)
  - Physiological/Environmental sensors
  - Computing platforms
  - Localization systems (supports collection of groundtruth data for testing/evaluation)
- Testing and validation for environmental and inter-system interference
- Applications to characterize structures/environments of concern
  - Buildings
  - Urban canyons,
  - Other structures
- Concepts inspired by discussions with Prof. Kaveh Pahlavan
- Not meant to be deployed on-mission, but to validate

Summary

- Significant breakthroughs achieved in wearable technology – platforms, radios, sensors

- Wearable technology is portable, energy efficient, low-cost and practical

- Significant growth opportunities
  - interpretation of collected physiological data
  - Automated subject guidance
  - Monitoring ➡ detection/diagnosis ➡ intervention, treatment and prevention