

Data Acquisition Prototype: Project & System Requirements

Phoenix Ambulatory Blood Pressure Monitoring System

13 July 2008

© 2008 Christopher J. Adams
Copying and distribution of this document is permitted in any medium, provided this notice is preserved

1

Agenda

- Project Vision
- System Vision & Scope (Business Requirements)
- User Requirements
 - Use Cases
 - Business Rules (Algorithms)
- System Requirements
 - Functional Requirements
 - Major Nonfunctional Requirements
- Requirements Work Outstanding

13 July 2008

2

Project Vision

- Acquire community knowledge about
 - Data acquisition devices
 - Hardware and software co-design
 - Partitioning systems into subsystems
 - Allocating system requirements to subsystems
 - Embedded software architecture options
(round robin, round robin w/ interrupts, ..., RTOS)
 - Hardware options
(MP, memory, gates, buses, ports, clocks, ...)
 - Acquiring hardware components
 - Testing embedded software
- Document results so they can be reproduced

13 July 2008

3

Project Vision

- Architecture — basic technology
 - Hardware architecture
 - Hardware component selection
 - Embedded software architecture
 - Software language selection
 - Cross-platform development tools
- Prototype
 - Learning is primary
 - Willing to abandon device based on lessons learned
- Acquired data may be simulated

13 July 2008

4

System Vision

- Data acquisition device
 - Collects analog signals from two piezoelectric film sensors
 - Measurement Specialties SDT1-028K
 - Converts analog signals to digital signals
 - Collects signals from
- Embedded analytics
 - Calculates [BP | Heart Rate | Blood Flow | easiest measurement to calculate]
- Embedded data storage
 - Timestamps each acquired & calculated value
 - Preserves acquired values beat-to-beat
 - Preserves calculated values (how often?)
 - Preserves up to (how many hours/days?) of data
- Device allows ambulation during use
 - At least carriable
- Electrically self-contained
 - Does not rely on external power source

13 July 2008

5

System Vision

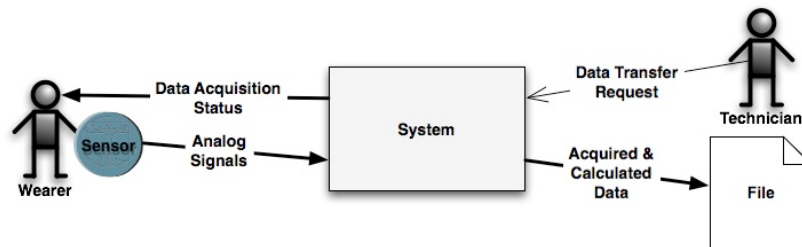
Major Out-of-Scope Capabilities

- Capacity for 7 days of data
- Device calibration
- Patient alerts
- Localization outside of U.S.

13 July 2008

6

System Context



13 July 2008

7

Use Cases

- Technician connects device to Weaver
- Weaver starts data collection
- Weaver confirms device is working
- Weaver signals the device to log an event
 - Assures data acquisition logic despite sensor failure
- Technician downloads data to a file

13 July 2008

8

Business Rules Algorithms

- BP | Heart Rate | Blood Flow?

13 July 2008

9

Functional Requirements

- Downloaded Data
 - ::=
 - Head
 - Device ID
 - (Absolute base time)
 - Timestamp of download initiation
 - Body
 - { Acquired/calculated Item }*
 - » Sensor ID/Data Source ID
 - » Timestamp of acquisition/calculation
 - » Information type
 - » Value
 - Tail
 - Timestamp of download completion
 - End of data marker
 - If timestamps are relative
 - then download must include absolute base time

13 July 2008

10

Functional Requirements

- Acquired/calculated information type
 - Acquisition control event
 - Start device
 - Stop device
 - Start acquisition
 - Stop acquisition
 - Wearer event
 - Acquired mV
 - *Analytic*

13 July 2008

11

Major Nonfunctional Requirements

- Interfaces
 - Outgoing
 - Downloaded data is well-formed XML
 - Physical Connectors
 - Device downloads data via a USB device
- Physical Constraints
 - Wearer wears or carries device during operation

13 July 2008

12