Floating Weather Station Commonality Analysis[1]

1. Introduction

Floating Weather Station (FWS) buoys are deployed at sea and periodically report the current wind speed via messages sent by radio. Each member of the FWS family contains an onboard computer that controls the operation of the buoy while it is at sea.

The purpose of this analysis is to provide the following capabilities for the FWS family of buoys:

- A way to specify the configuration of a particular buoy.
- A way to generate, for a specified buoy configuration, the software that controls a buoy while it is at sea.

2. Overview

This commonality analysis is concerned with the following issues:

- What equipment configurations should be accommodated?
- What computing platforms should be used on buoys?
- What capabilities will be needed to make buoys sufficiently reliable to perform their missions?

Interfaces To Other Domains

Floating Weather Stations interact with systems that are equipped to receive the signals transmitted by the onboard radio transmitter. Such systems may be shipboard, ground-based, or satellite-based. The software for the FWS domain interfaces with the sensors that the FWS uses to monitor wind speed, and with the transmitter that the FWS uses to send messages. FIGURE 1 shows theses domains and gives a brief indication of the nature of the interface. For example, the Sensor domain receives commands from the FWS software and sends data to it.

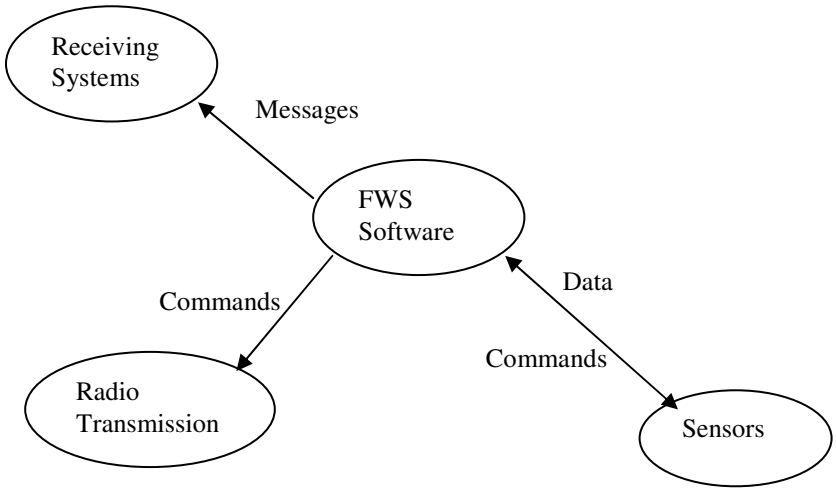

FIGURE 1. FWS Software and Interfacing Domains

[1] The FWS example and commonalty analysis are taken, with permission of the authors, from the draft text of *Engineering Domains: A Family Based Software Development Process*, by David M. Weiss and Chi Tau Robert Lai, to be published by Addison Wesley.

3. Dictionary of Terms

TERM	MEANING
Sensor period	The number of seconds between sensor readings
Transmission period	The number of seconds between message transmissions
Weighted average	Given a set of value/weight pairs: { (v1,w1), (v2,w2), …, (vN,WN) } where w*i* >= 0 for all i in [1..N] their Weighted average is (v1*w1 + v2*w2 + … + vN*WN) / (w1 + w2 + … + wN)
Wind speed	The speed of the wind in knots: nautical miles per hour

4. Commonalities

The following statements are basic assumptions about the FR'S domain, i.e., they are true of all FWS systems.

Behavior

C1. At fixed intervals, the FWS transmits messages containing an approximation of the current *wind speed* at its location.

Devices

C3. The FWS is equipped with one or more sensors that monitor w*ind speed.*

5. Variabilities

The following statements describe how a FWS may vary.

Behavior

V 1. The formula used for computing w*ind speed* from the sensor readings may vary. In particular, the weights used for the high resolution and low resolution sensors may vary, and the number of readings of each sensor used (the history of the sensor) may vary.

6. Issues