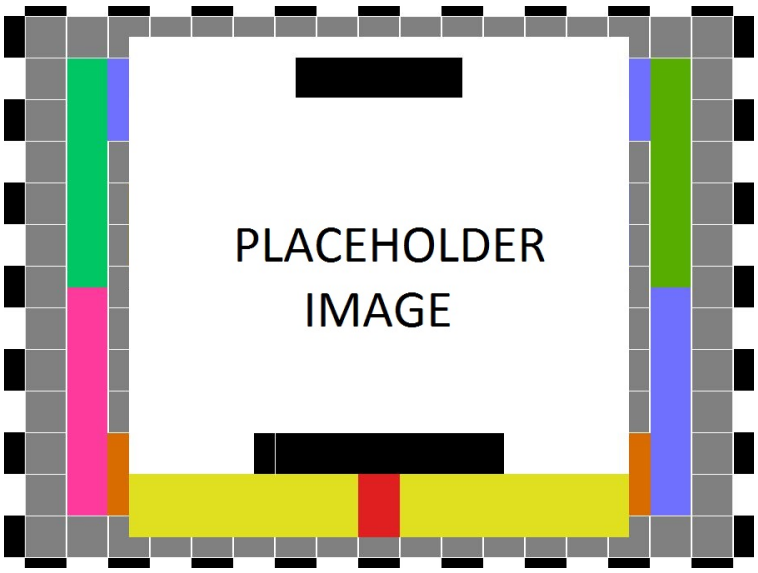
Department of Computer Science & Engineering
The University of Texas at Arlington

Architectural Design Specification
CSE 4316: Senior Design I
Fall 2015



Team Name
Product Name

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John Von Neumann
Ada Lovelace
Charles Babbage

Revision History

Revision	Date	Author(s)	Description
0.1	10.01.2015	GH	document creation
0.2	10.05.2015	AT, GH	complete draft
0.3	10.12.2015	AT, GH	release candidate 1
1.0	10.20.2015	AT, GH, CB	official release
1.1	10.31.2015	AL	added design review requests

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1 INTRODUCTION

Your introduction should describe your product concept in sufficient detail that the architectural design will be easy to follow. The introduction may include information used in the first sections of your SRS for this purpose. At a minimum, ensure that the product concept, scope and key requirements are described.

2 System Overview

Our submarine design consists of 4 overall design systems. The control system, the movement system, the debris collection system and the visual system. The overall system works together delivering data between these various sub systems in order to insure that the pilot of the submarine can accurately execute actions related to operating the submarine.

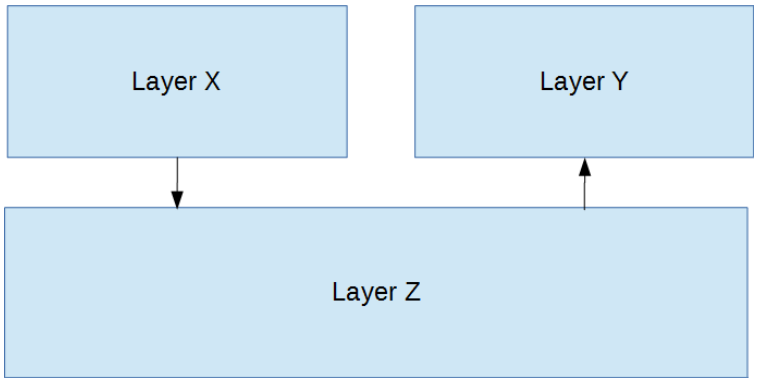

Figure 1: A simple architectural layer diagram

2.1 Control Layer Description

The control layer involves using the library ArduPilot to call a control system that will operate the underwater vehicle on 6 degrees of freedom. As such the vehicle will need the capability of turning on all axis as well as horizontal spins. It will send its commend through the tether connected to the vehicle and the motor operation will be updated according to the library specifications. The ArduSub sublibrary of the ArduPilot series of libraries has a specification with motor placement that must be followed in order to achieve full functionality from the library.

The control layer also receives input data through the tether from the visual system. That input data is displayed for the pilot onto a monitor system which contains an overlay with some targeting assistance graphics built on top of the display.

All of this data is manipulated through the tether which connects our generic RV controller with micro-controllers installed directly on the vehicle. The vehicle itself will contain between 2-4 micro-controllers that will be responsible for turning on and off the electrical signals.

2.2 Movement Layer Description

The movement layer currently consists of a set of 6 thrusters. The thrusters must be placed at predefined specified locations to conform to ArduPilot library's prebuilt specifications. In order to obtain 8 degrees of freedom we will need 2 rear thrusters, and then 4 thrusters placed at various points in a circular fashion all differing by 45 degrees from eachother. The thrusters are turned off and on via electrical signals from micro controllers installed on the vehicle in the control layer. The directional capability of the movement system is all handled automatically by ArduPilot, our system will only implement the thrusters in the specifications according to the ArduPilot library.

2.3 Debris Collection Layer Description

The debris collection layer consists of a mechanical arm to collect sunken debris, and a net pulley system to collect floating debris. The net pulley system will collect the floating debris and deposit the debris into a catapult system which will then launch the debris into the collection area. The mechanical arm

system will receive signals to clasp the sunken debris from the control system and then release it via the same control system.

2.4 Visual Layer Description

The visual layer is the one layer that is meant to deliver information back to the control layer. The information is collected through a waterproof camera on the front of the submarine and then transmitted through the tether to be displayed on the monitor of the control system.

3 SUBSYSTEM DEFINITIONS & DATA FLOW

This section breaks down your layer abstraction to another level of detail. Here you grapically represent the logical subsytems that compose each layer and show the interactions/interfaces between those subsystems. A subsystem can be thought of as a programming unit that implements one of the major functions of the layer. It, therefore, has data elements that serve as source/sinks for other subsystems. The logical data elements that flow between subsystems need to be explicitly defined at this point, beginning with a data flow-like diagram based on the block diagram.

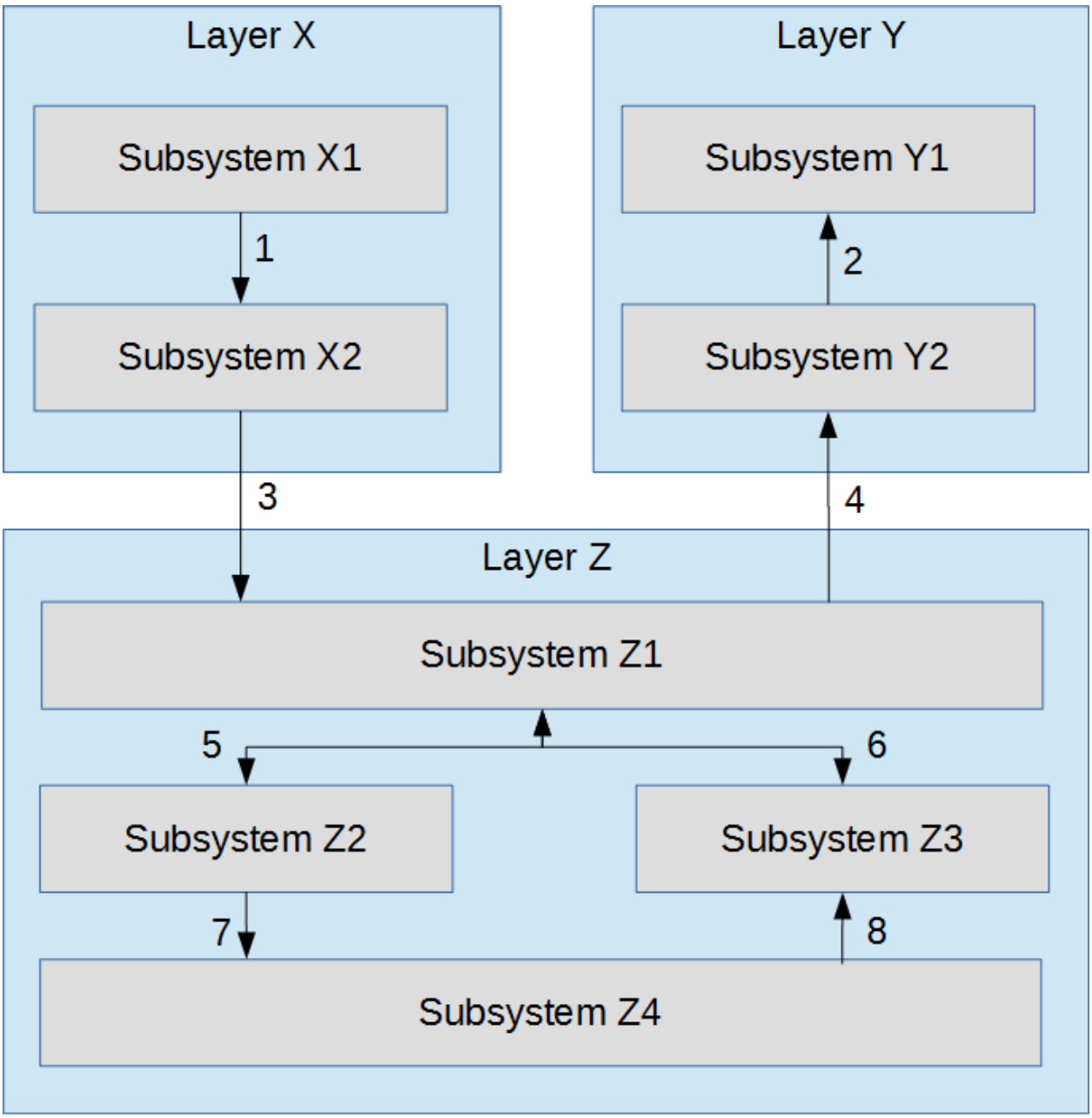

Figure 2: A simple data flow diagram

4 X LAYER SUBSYSTEMS

In this section, the layer is described in some detail in terms of its specific subsystems. Describe each of the layers and its subsystems in a separate chapter/major subsection of this document. The content of each subsystem description should be similar. Include in this section any special considerations and/or trade-offs considered for the approach you have chosen.

4.1 SUBSYSTEM 1

This section should be a general description of a particular subsystem for the given layer. For most subsystems, an extract of the architectural block diagram with data flows is useful. This should consist of the subsystem being described and those subsystems with which it communicates.

Figure 3: Example subsystem description diagram

4.1.1 ASSUMPTIONS

Any assumptions made in the definition of the subsystem should be listed and described. Pay particular attention to assumptions concerning interfaces and interactions with other layers.

4.1.2 RESPONSIBILITIES

Each of the responsibilities/features/functions/services of the subsystem as identified in the architectural summary must be expanded to more detailed responsibilities. These responsibilities form the basis for the identification of the finer-grained responsibilities of the layer's internal subsystems. Clearly describe what each subsystem does.

4.1.3 SUBSYSTEM INTERFACES

Each of the inputs and outputs for the subsystem are defined here. Create a table with an entry for each labelled interface that connects to this subsystem. For each entry, describe any incoming and outgoing data elements will pass through this interface.

Table 2: Subsystem interfaces

ID	Description	Inputs	Outputs
#xx	Description of the interface/bus	input 1 input 2	output 1
#xx	Description of the interface/bus	N/A	output 1

4.2 SUBSYSTEM 2

Repeat for each subsystem

4.3 SUBSYSTEM 3

Repeat for each subsystem

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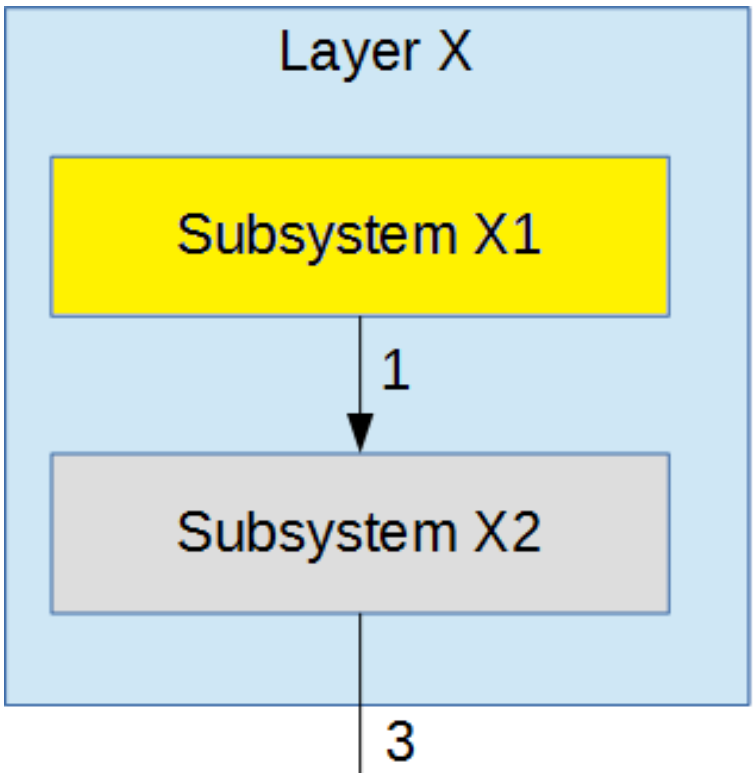

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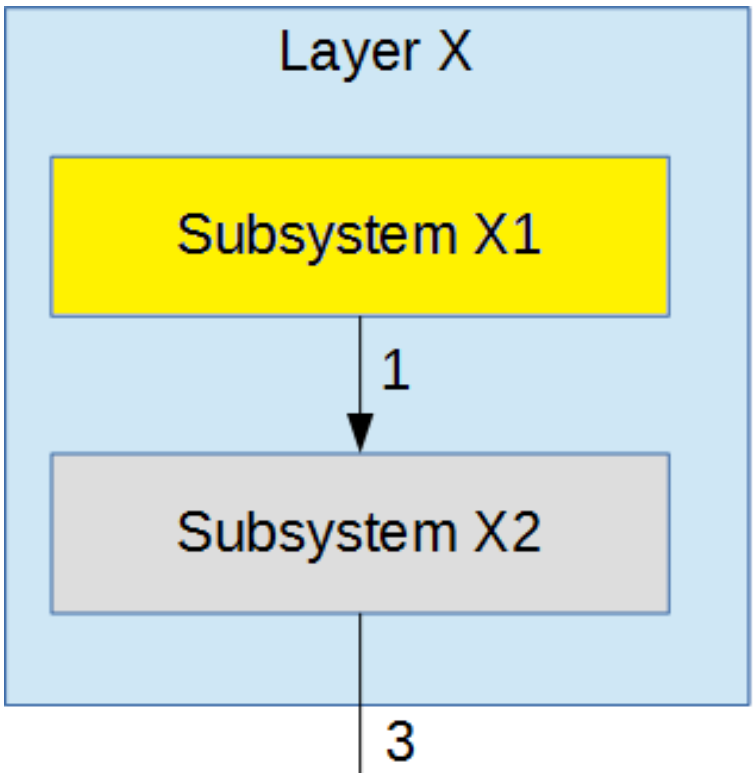

Figure 5: Example subsystem description diagram

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References