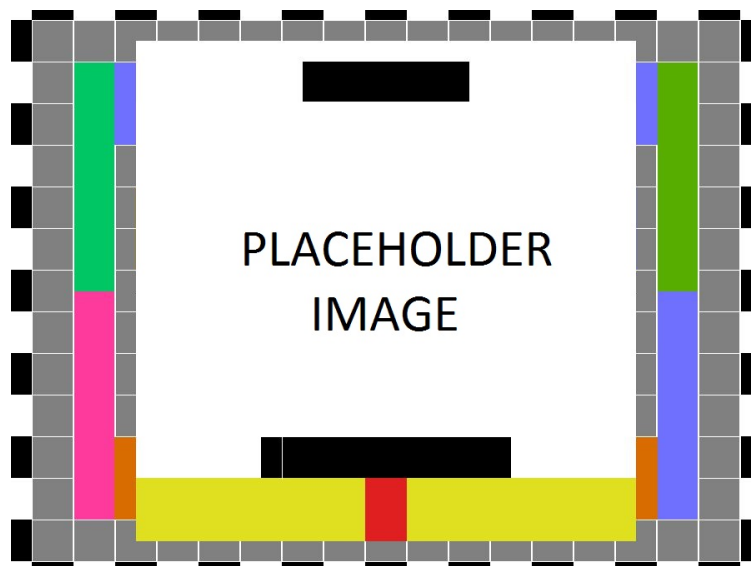


**DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING
THE UNIVERSITY OF TEXAS AT ARLINGTON**

**DETAILED DESIGN SPECIFICATION
CSE 4317: SENIOR DESIGN II
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PRODUCT NAME

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REVISION HISTORY

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1.1	1.31.2016	AL	added design review requests

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1 INTRODUCTION

Your introduction should provide a brief overview of the product concept and a reference to the requirement specification and architectural design documents in 1 or 2 paragraphs. The purpose is to provide the reader with the location of relevant background material that lead to the design details presented in this document.

2 SYSTEM OVERVIEW

This section should reintroduce the full data flow diagram from the architectural specification, and discuss at a high level the purpose of each layer. You do not need to include a subsection for each layer, a 1 - 2 paragraph recap is sufficient.

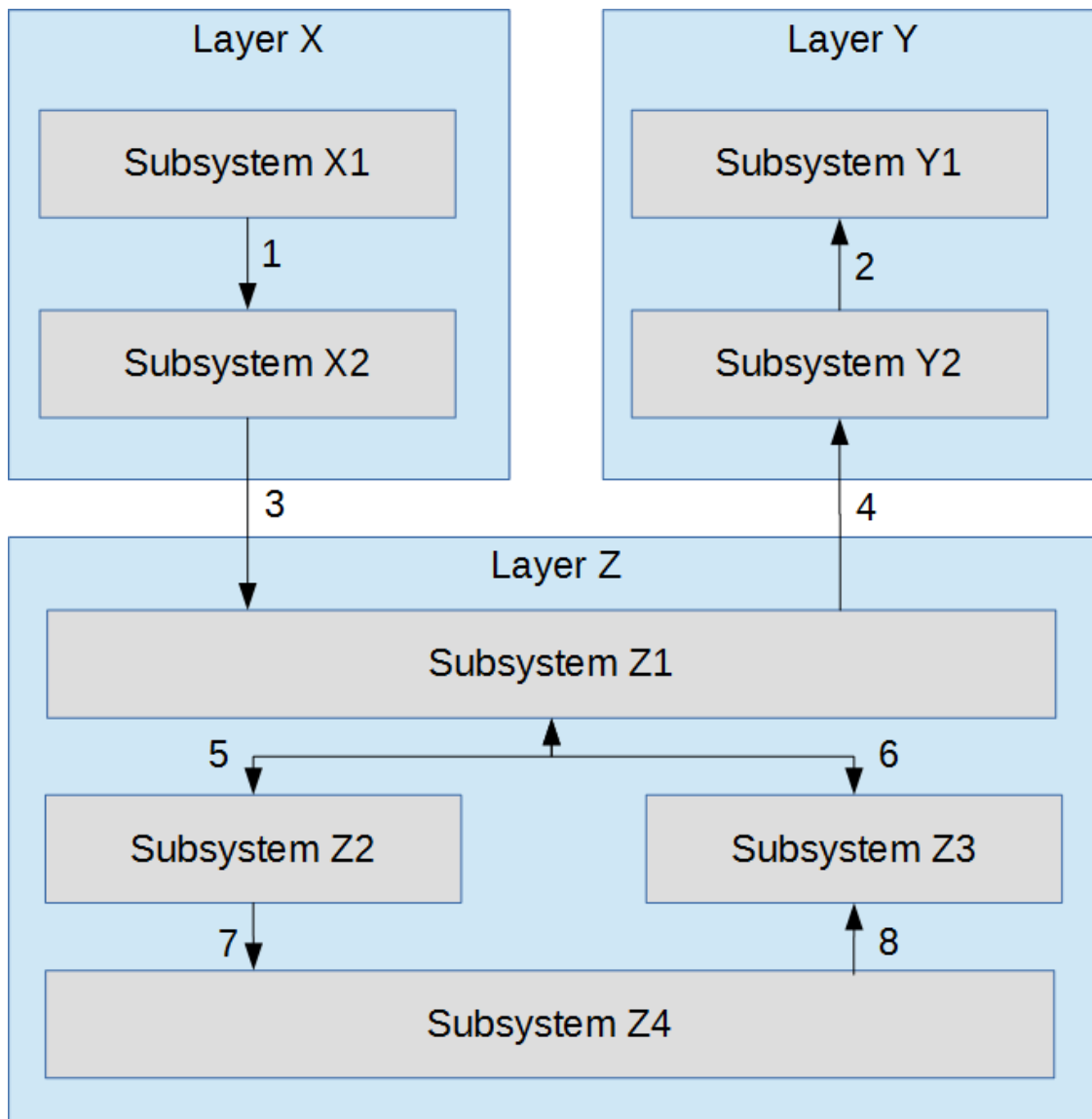


Figure 1: System architecture

3 BREW SYSTEM VESSEL LAYER SUBSYSTEMS

This section is completely depended upon the hardware. It is composed of only hardware all combined together to form a suitable environment for brewing. All the hardware must be connected properly with the system to ensure quality beverages.

3.1 LAYER HARDWARE

The most important hardware required for this layer are three vessels/kettles, probably of 5 gallon each. Each vessel is connected to the 330 GPH Low Suction Electric pumps with suction hose to pump the liquid out of the vessels and DS18B20 Thermometer Temperature Sensor Probe in order to keep track of the temperature in each vessel.

3.2 LAYER OPERATING SYSTEM

There is no operating system involved in this layer. However, the temperature data and the pump of this layer is controlled by the Arduino Uno micro controller which is in different layer.

3.3 LAYER SOFTWARE DEPENDENCIES

Since this is completely hardware dependent layer, there is no any software dependencies.

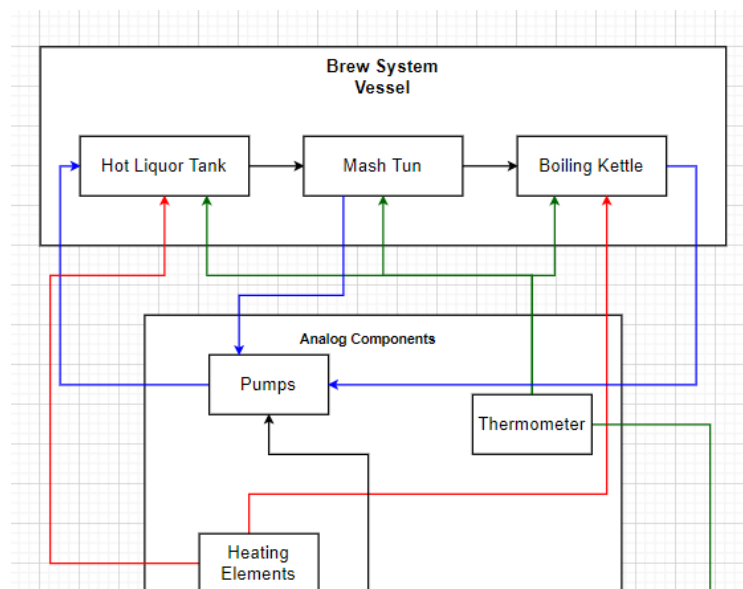


Figure 2: Brew System Vessel Layer Representation

3.4 HOT LIQUOR TANK SUBSYSTEM (HLT)

The main purpose of Hot Liquor Tank subsystem is to monitor and heat the water to the desired temperature. This subsystem is simply a vessel hardware used for boiling purpose.

3.4.1 SUBSYSTEM HARDWARE

Apart from the hardware mentioned above, this subsystem have one more hardware involved which is a Kettle Heating Element.

3.4.2 SUBSYSTEM OPERATING SYSTEM

No Operating System is involved in this subsection.

3.4.3 SUBSYSTEM SOFTWARE DEPENDENCIES

The Heating Element is depended on the input provided by the user on the basis of temperature as the water is only heated to that temperature. So, this subsystem require input from the user/brewer to properly function.

3.4.4 SUBSYSTEM PROGRAMMING LANGUAGES

In order to provide the input, the user is using Arduino programming language for Arduino Uno.

3.4.5 SUBSYSTEM DATA STRUCTURES

No specific data structures are being used in this subsystem. It is plain number being passed in and out of this subsystem.

3.4.6 SUBSYSTEM DATA PROCESSING

The thermometer temperature sensor probe reads the data and simply passes it to micro controller and the micro controller uses that data in order to raise the temperature of water by turning on or off the heating element.

3.5 MASH TUN SUBSYSTEM

The main purpose of Mash Tun subsystem is to mix the hot water with grains to produce wort. This subsystem is simply a vessel hardware to separate mash and wort.

3.5.1 SUBSYSTEM HARDWARE

There are no separate hardware used in this subsystem.

3.5.2 SUBSYSTEM OPERATING SYSTEM

No Operating System is involved in this subsection.

3.5.3 SUBSYSTEM SOFTWARE DEPENDENCIES

The hardware used in this subsystem are not software dependencies.

3.5.4 SUBSYSTEM PROGRAMMING LANGUAGES

No programming languages are used.

3.5.5 SUBSYSTEM DATA STRUCTURES

No specific data structures are being used in this subsystem. there is just a float value being passed out of this subsystem.

3.5.6 SUBSYSTEM DATA PROCESSING

The thermometer temperature sensor probe reads the data and simply passes it to micro controller.

3.6 BOILING KETTLE SUBSYSTEM

The main purpose of Boiling Kettle subsystem is to boil wort for the required amount of time. This subsystem is simply the final vessel hardware used to produce beverage.

3.6.1 SUBSYSTEM HARDWARE

Apart from the hardware mentioned above, this subsystem have more hardware involved like a Kettle Heating Element and a NY Brew Supply copper wort chiller.

3.6.2 SUBSYSTEM OPERATING SYSTEM

No Operating System is involved in this subsection.

3.6.3 SUBSYSTEM SOFTWARE DEPENDENCIES

The software dependencies is similar to Hot Liquor Tank Subsystem. The Heating Element is depended on the input provided by the user on the basis of temperature as the wort is only heated to that temperature.

3.6.4 SUBSYSTEM PROGRAMMING LANGUAGES

In order to provide the input, the user is using Arduino programming language for Arduino Uno.

3.6.5 SUBSYSTEM DATA STRUCTURES

No specific data structures are being used in this subsystem. It is plain number being passed in and out of this subsystem.

3.6.6 SUBSYSTEM DATA PROCESSING

The thermometer temperature sensor probe reads the data and simply passes it to micro controller and the micro controller uses that data in order to raise the temperature of water by turning on or off the heating element. After the desired time is reached, the wort is sent to chiller which then cool downs to form beverages.

4 Y LAYER SUBSYSTEMS

In this section, the layer is described in terms of the hardware and software design. Specific implementation details, such as hardware components, programming languages, software dependencies, operating systems, etc. should be discussed. Any unnecessary items can be omitted (for example, a pure software module without any specific hardware should not include a hardware subsection). The organization, titles, and content of the sections below can be modified as necessary for the project.

4.1 LAYER HARDWARE

A description of any involved hardware components for the layer. For example, if each subsystem is a software process running on an embedded computer, discuss the specifics of that device here. Do not list a hardware component that only exists at the subsystem level (include it in the following sections).

4.2 LAYER OPERATING SYSTEM

A description of any operating systems required by the layer.

4.3 LAYER SOFTWARE DEPENDENCIES

A description of any software dependencies (libraries, frameworks, etc) required by the layer.

4.4 SUBSYSTEM 1

Describe at a high level the purpose and basic design of this subsystem. Is it a piece of hardware, a class, a web service, or something else? Note that each of the subsystem items below are meant to be specific to that subsystem and not a repeat of anything discussed above for the overall layer.

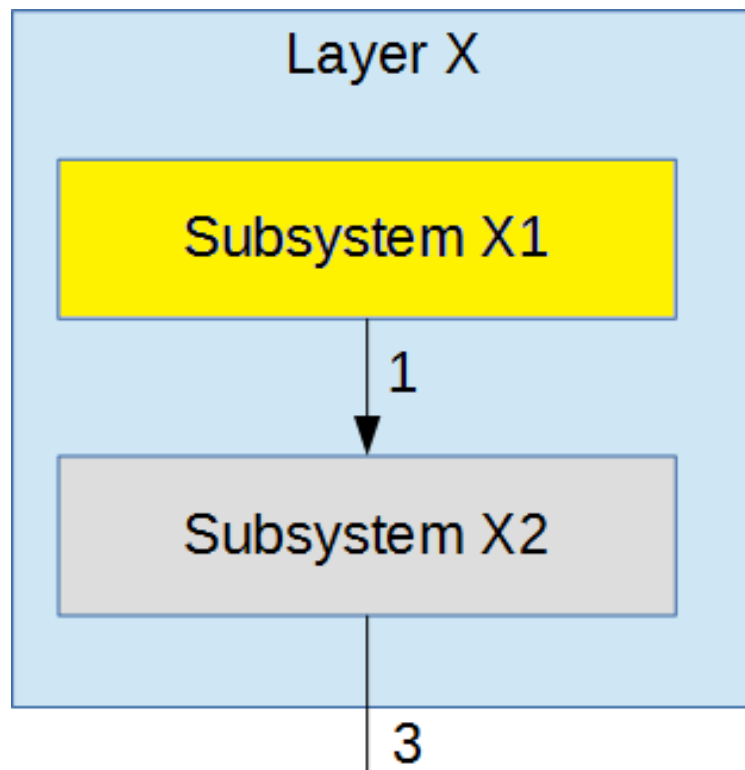


Figure 3: Example subsystem description diagram

4.4.1 SUBSYSTEM HARDWARE

A description of any involved hardware components for the subsystem.

4.4.2 SUBSYSTEM OPERATING SYSTEM

A description of any operating systems required by the subsystem.

4.4.3 SUBSYSTEM SOFTWARE DEPENDENCIES

A description of any software dependencies (libraries, frameworks, design software for mechanical parts or circuits, etc) required by the subsystem.

4.4.4 SUBSYSTEM PROGRAMMING LANGUAGES

A description of any programming languages used by the subsystem.

4.4.5 SUBSYSTEM DATA STRUCTURES

A description of any classes or other data structures that are worth discussing for the subsystem. For example, data being transmitted from a microcontroller to a PC via USB should be first be assembled into packets. What is the structure of the packets?

4.4.6 SUBSYSTEM DATA PROCESSING

A description of any algorithms or processing strategies that are worth discussing for the subsystem. If you are implementing a well-known algorithm, list it. If it is something unique to this project, discuss it in greater detail.

5 Z LAYER SUBSYSTEMS

In this section, the layer is described in terms of the hardware and software design. Specific implementation details, such as hardware components, programming languages, software dependencies, operating systems, etc. should be discussed. Any unnecessary items can be omitted (for example, a pure software module without any specific hardware should not include a hardware subsection). The organization, titles, and content of the sections below can be modified as necessary for the project.

5.1 LAYER HARDWARE

A description of any involved hardware components for the layer. For example, if each subsystem is a software process running on an embedded computer, discuss the specifics of that device here. Do not list a hardware component that only exists at the subsystem level (include it in the following sections).

5.2 LAYER OPERATING SYSTEM

A description of any operating systems required by the layer.

5.3 LAYER SOFTWARE DEPENDENCIES

A description of any software dependencies (libraries, frameworks, etc) required by the layer.

5.4 SUBSYSTEM 1

Describe at a high level the purpose and basic design of this subsystem. Is it a piece of hardware, a class, a web service, or something else? Note that each of the subsystem items below are meant to be specific to that subsystem and not a repeat of anything discussed above for the overall layer.

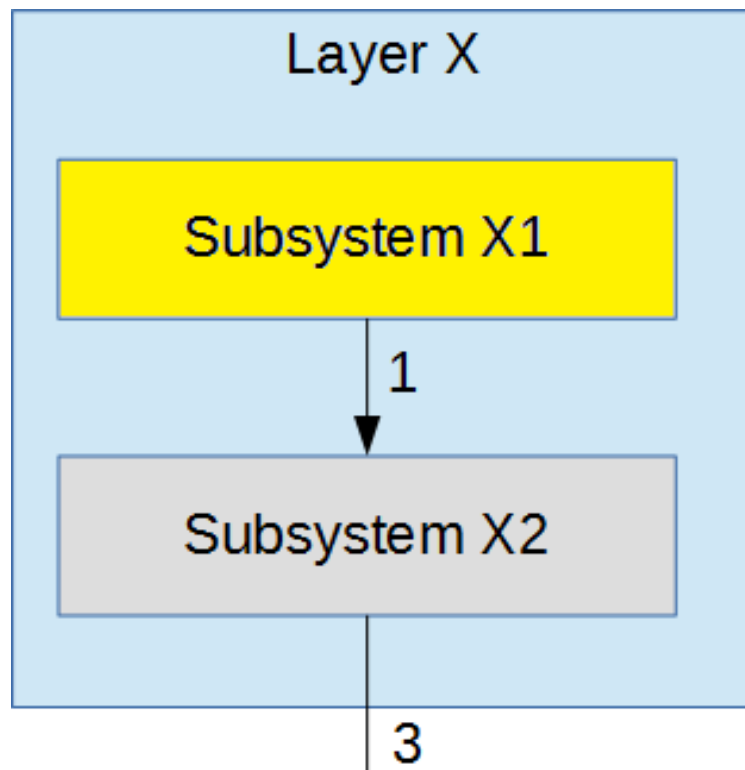


Figure 4: Example subsystem description diagram

5.4.1 SUBSYSTEM HARDWARE

A description of any involved hardware components for the subsystem.

5.4.2 SUBSYSTEM OPERATING SYSTEM

A description of any operating systems required by the subsystem.

5.4.3 SUBSYSTEM SOFTWARE DEPENDENCIES

A description of any software dependencies (libraries, frameworks, design software for mechanical parts or circuits, etc) required by the subsystem.

5.4.4 SUBSYSTEM PROGRAMMING LANGUAGES

A description of any programming languages used by the subsystem.

5.4.5 SUBSYSTEM DATA STRUCTURES

A description of any classes or other data structures that are worth discussing for the subsystem. For example, data being transmitted from a microcontroller to a PC via USB should be first be assembled into packets. What is the structure of the packets?

5.4.6 SUBSYSTEM DATA PROCESSING

A description of any algorithms or processing strategies that are worth discussing for the subsystem. If you are implementing a well-known algorithm, list it. If it is something unique to this project, discuss it in greater detail.

6 APPENDIX A

Include any additional documents (CAD design, circuit schematics, etc) as an appendix as necessary.

REFERENCES