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

# Architectural Design Specifications
# CSE 4316: Senior Design I
# Spring 2021


## Team Friendship
## Back Burner Brew

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## 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

The "Back Burner Brew" is built with the sole purpose of brewing large batch of beer in the home environment. This product provides home brewers with a low-cost electric home brewing system that allow them to have precise control over the brewing process. The brewing process can be automated with the help of micro-controllers like the ESP32 which is then hosted to a local website or an app interface.

ESP32 is a micro-controller that can receive data such as current temperature of the water or mash from the heat sensors located inside the kettles which can be converted to either analog or digital input. The heating coil can be controled using the input from the user as per their desired either to increase or to decrease the temperature. The electric pump can also be controlled by the user through micro-controllers to regulate the flow of the water in the kettles. The user will be able to communicate with the brewing system through a web interface or app interface.

The user should expect to input desired commands, controls, and specific settings such as temperature and length of time by a easily accessible touchscreen. The touchscreen will be attached to a Raspberry Pi that will handle communications between the user and the various sensors and heating elements. The user can expect that whichever temperature they set for their desired application, that the temperature will remain constant.

The intended audiences for this product would be home brewers or person interested in brewing beer only. Provided that the user manual would be present in the product, any person who wants to brew beer in his local environment can easily use this product. This product is made focusing on how effortless can the brewing process gets simply with the use of micro-controller.

# 2 System Overview

This section should describe the overall structure of your software system. Think of it as the strategy for how you will build the system. An architectural "layer" is the top-level logical view, or an abstraction, of your design. Layers should be composed of related elements of similar capabilities, and should be highly independent of other layers, but should have very clearly defined interfaces and interactions with other layers. Each layer should be identified individually and should be unique as to its function and purpose within the system. This section should also contain the high-level block diagram of the layers, as shown in the example below, as well as detailed descriptions of the functions of each layer.

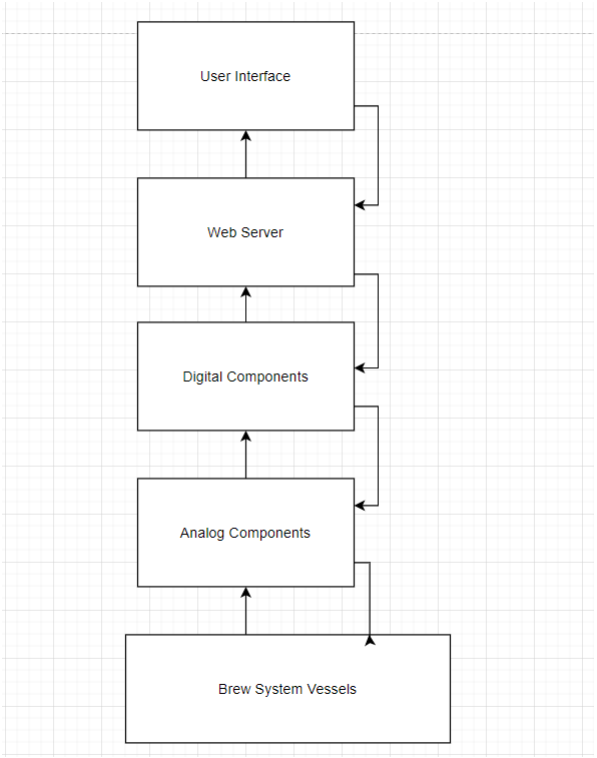


Figure 1: Simple ADS

## 2.1 Brew System Vessel Layer

Each layer should be described separately in detail. Descriptions should include the features, functions, critical interfaces and interactions of the layer. The description should clearly define the services that the layer provides. Also include any conventions that your team will use in describing the structure: naming conventions for layers, subsystems, modules, and data flows; interface specifications; how layers and subsystems are defined; etc.

## 2.2 Analog Components Layer

Each layer should be described separately in detail. Descriptions should include the features, functions, critical interfaces and interactions of the layer. The description should clearly define the services that the layer provides. Also include any conventions that your team will use in describing the structure: naming conventions for layers, subsystems, modules, and data flows; interface specifications; how layers and subsystems are defined; etc.

## 2.3 Digital Components Layer

Each layer should be described separately in detail. Descriptions should include the features, functions, critical interfaces and interactions of the layer. The description should clearly define the services that the layer provides. Also include any conventions that your team will use in describing the structure: naming conventions for layers, subsystems, modules, and data flows; interface specifications; how layers and subsystems are defined; etc.

## 2.4 Web Server Layer

Each layer should be described separately in detail. Descriptions should include the features, functions, critical interfaces and interactions of the layer. The description should clearly define the services that the layer provides. Also include any conventions that your team will use in describing the structure: naming conventions for layers, subsystems, modules, and data flows; interface specifications; how layers and subsystems are defined; etc.

## 2.5 User Interface Layer

Each layer should be described separately in detail. Descriptions should include the features, functions, critical interfaces and interactions of the layer. The description should clearly define the services that the layer provides. Also include any conventions that your team will use in describing the structure: naming conventions for layers, subsystems, modules, and data flows; interface specifications; how layers and subsystems are defined; etc.

# 3 Subsystem Definitions & Data Flow

The Back Burner Brew system will consist of five different subsystems: brew system vessels, analog components, digital components, web server, and the user interface. The brew system vessels will be operated through the analog components. The analog components will send data to digital components. The analog components will be controlled by the digital components based on what is input to the user interface or certain conditions that are predefined such as keep water a certain temperature. The web server will be the intermediary between the user interface and the digital components. The web server will also store all data associated with the brewing process such as temperature or time spent on specific tasks.

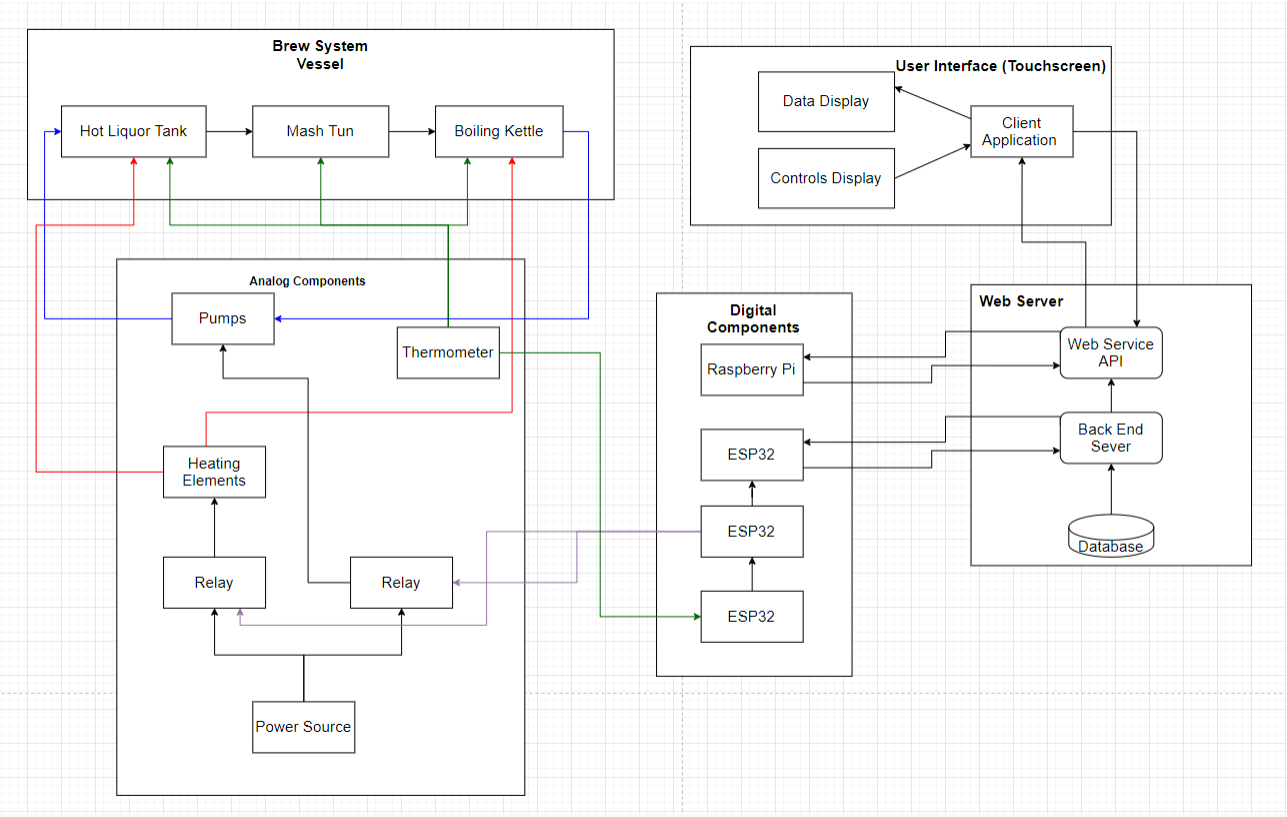


Figure 2: Subsystem Diagram for the Back Burner Brew device.

# 4 Brew System Vessel 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.

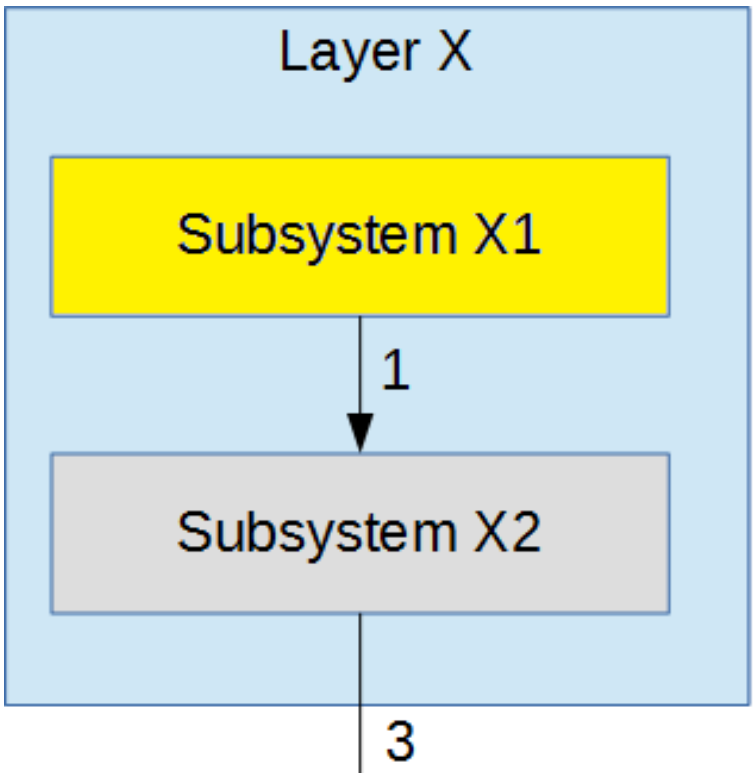


Figure 3: Example subsystem description diagram

### 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<br>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

# 5 Analog Components Layer Subsystems

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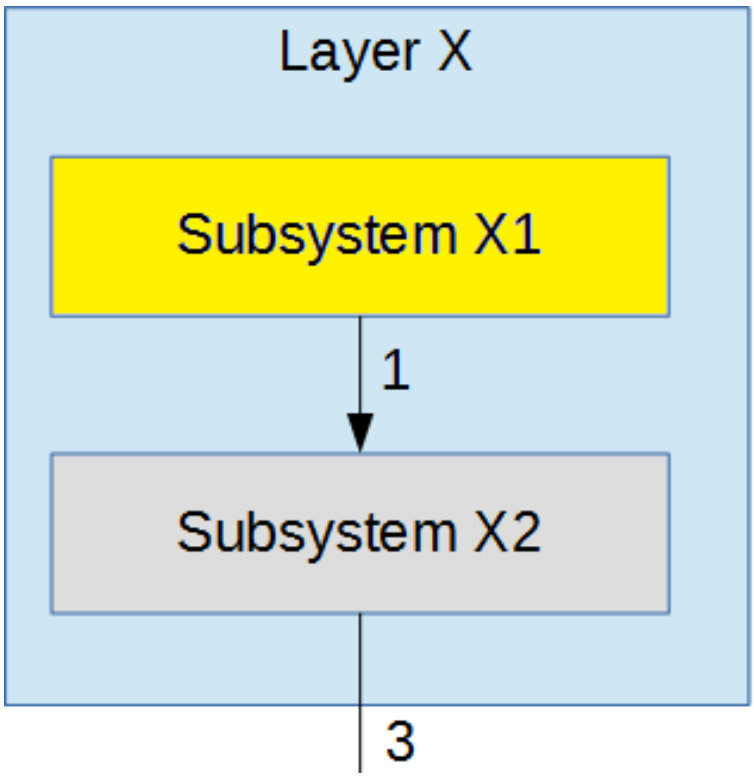


Figure 4: Example subsystem description diagram

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Repeat for each subsystem

### 5.3 SUBSYSTEM 3

Repeat for each subsystem

# 6 Digital Components 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.

## 6.1 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.

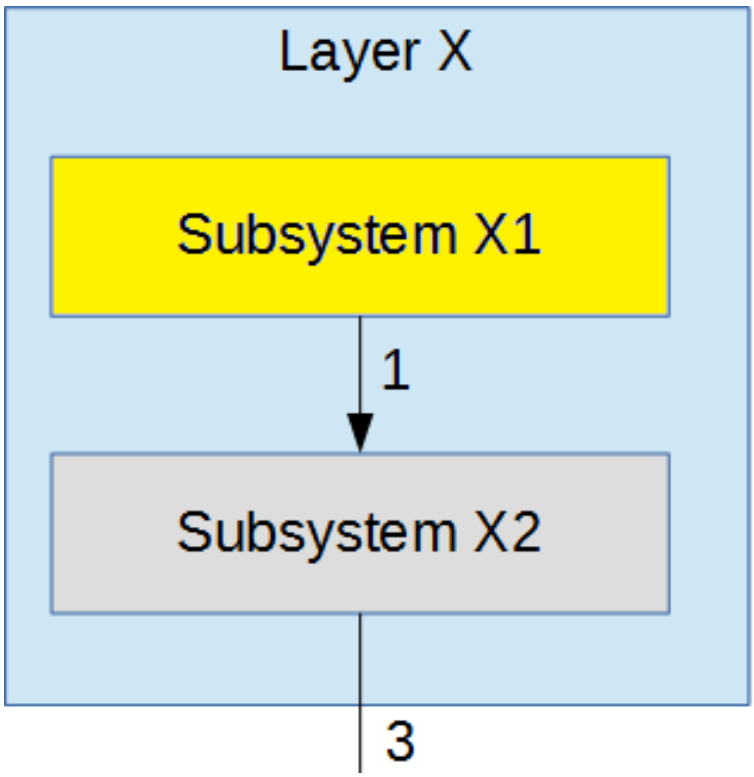


Figure 5: Example subsystem description diagram

### 6.1.1 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.

### 6.1.2 Responsibilities

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Table 4: Subsystem interfaces

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

### 6.2 SUBSYSTEM 2

Repeat for each subsystem

### 6.3 SUBSYSTEM 3

Repeat for each subsystem

# 7 Web Server 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.

## 7.1 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.

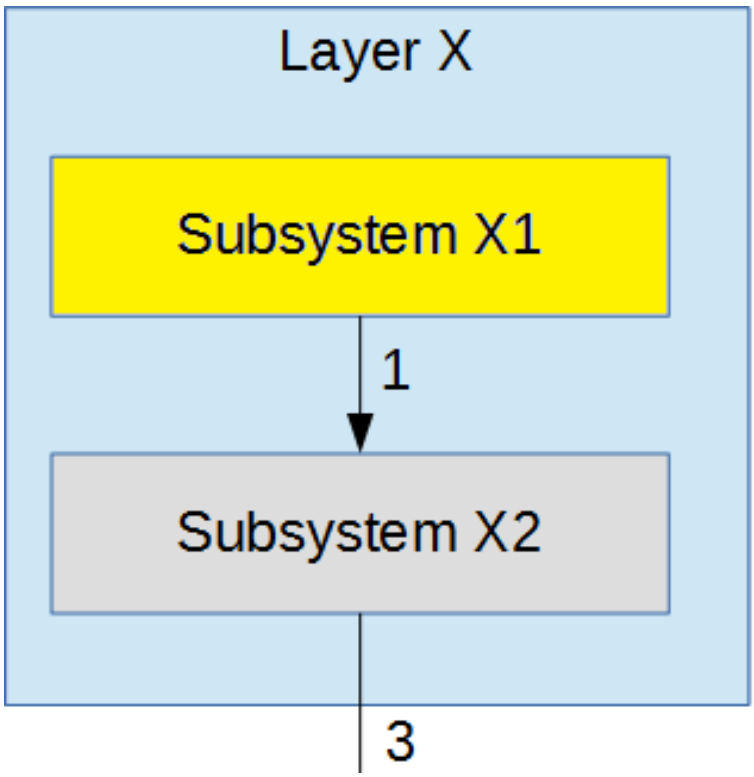


Figure 6: Example subsystem description diagram

### 7.1.1 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.

### 7.1.2 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.

### 7.1.3 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 5: Subsystem interfaces

| ID | Description | Inputs | Outputs |
|---|---|---|---|
| #xx | Description of the interface/bus | input 1<br>input 2 | output 1 |
| #xx | Description of the interface/bus | N/A | output 1 |

### 7.2 Subsystem 2

Repeat for each subsystem

### 7.3 Subsystem 3

Repeat for each subsystem

# 8 User Interface Layer Subsystems

The touchscreen device will retrieve application data from the web server to display information from the current brew. The display will also offer a Graphical User interface where the user can input commands to modify the current brew. The client application running on this device will then interpret the data, and either display it on the Data Display or send it back to the server as commands accordingly.

## 8.1 Data Display

The data display will display real-time information relevant to the current brew. The data display will retrieve this data from the web server.

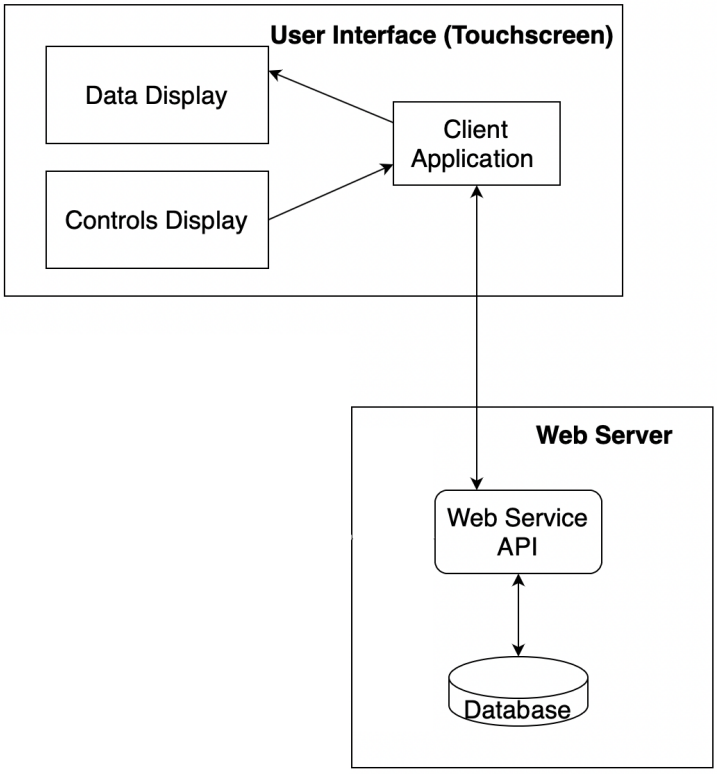


Figure 7: User Interface subsystem diagram

### 8.1.1 Assumptions

- The device will receive the data and interpret it correctly on the touchscreen.
- The data received from the server will be accurate and up-to-date.
- The device will have a stable connection to the server throughout the brew.

### 8.1.2 Responsibilities

The device will receive accurate and relevant information from the server and display it on the touchscreen for the user to make decisions on the current brew. This information will include current set temperature, length of time the temperature has been set, how much longer brew will stay at current temperature, and any other information that may be relevant.

### 8.1.3 Subsystem Interfaces

Table 6: Subsystem interfaces

| ID | Description | Inputs | Outputs |
|---|---|---|---|
| #xx | Data Display | Data from server | Brew information |

## 8.2 Controls Display

The controls display on the touchscreen will allow the user to interact with and send commands to the server, which will relay the data to the brewing system.

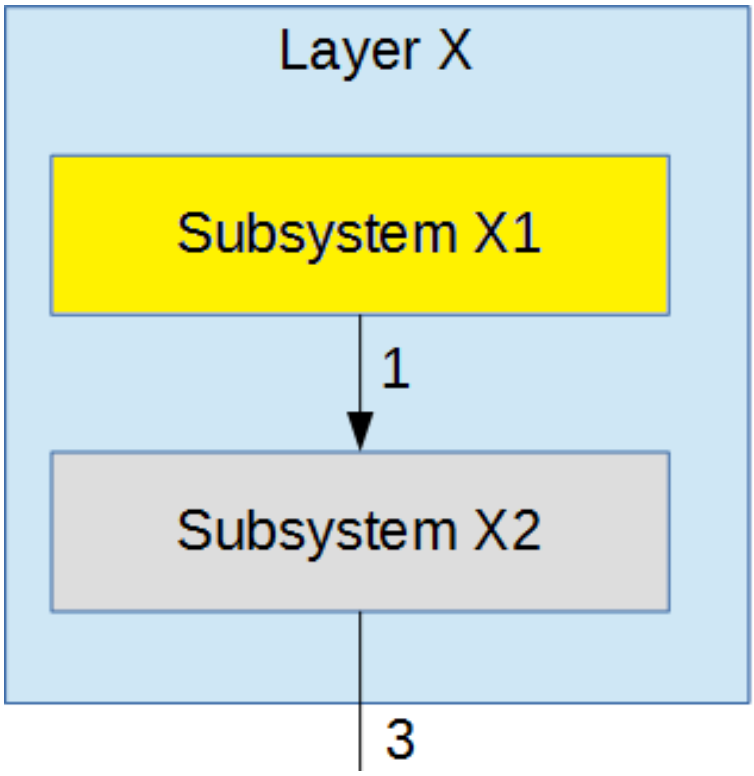


Figure 8: Example subsystem description diagram

### 8.2.1 Assumptions

- The client application will read user commands correctly and send them following the established protocol.
- The device will be quick in sending commands to the server.
- The device will have a stable connection to the server throughout the brew.

### 8.2.2 Responsibilities

The touchscreen will allow the user to enter commands such as set, increase, or decrease temperature and/or the length of time temperature is set. The interface will be intuitive and easy to use. The client

application will then take the commands, and send them to the server following the set communcation protocol. Commands sent will update the information on the data display if applicable.

### 8.2.3 Subsystem Interfaces

Table 7: Subsystem interfaces

| ID | Description | Inputs | Outputs |
|---|---|---|---|
| #xx | Controls Display | User input | Data to server |

## REFERENCES