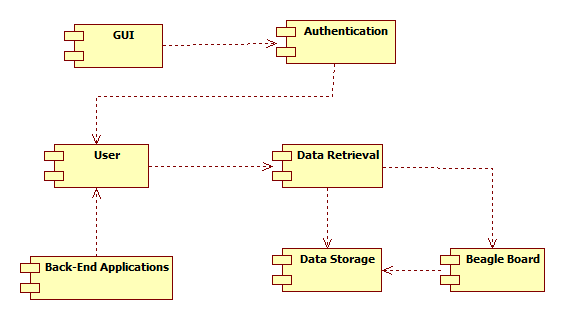
# 5. System Architecture

A general description of the Smart Home system architecture is presented in the following sections.

## 5.1 Architectural Design

Smart Home is a web and embedded base software which is composed of seven components; GUI, Authentication, User, Data Retrieval, Back End Application, Data Storage, Beagle Board. The component diagram illustrates structure of the system. Each component will be explained separately in the next section.



**Figure: Component Diagram of the System**

## 5.2 Description of Components

In this section, components mentioned in 5.1 are described individually a section. Each description contains short definition, processing narrative for component, interface description, component processing detail and dynamic behavior.

### 5.2.1 GUI

Graphical user interface provides user to use system easily. This is obtained by using button, textbox etc.

#### 5.2.1.1 Processing Narrative for GUI

This component comprises all the objects and shows them as appropriate kind. This component works in client side through HTML. Server side sends desired information and client side interpret as desired. This component manages this overflow by creating dynamic HTML webpage through ASP.NET.

#### 5.2.1.2 GUI Interface Description

There are inputs from client side. Then, this input stack sends to server side with necessity information. Server side processes this information and also makes some information transformation with other components and return desired information as output. On the other hand, this output stack reaches the client side successfully. Client side creates dynamically desired webpage through using output information.

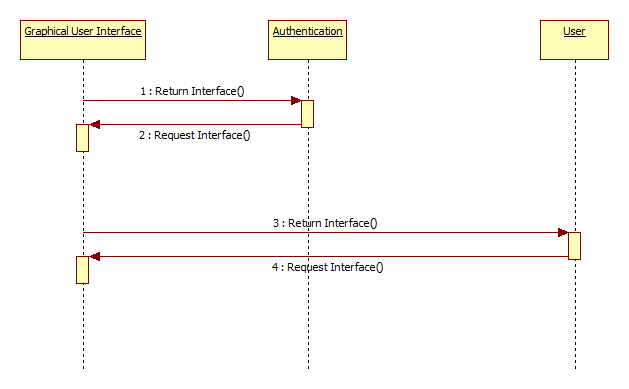
#### 5.2.1.2 GUI Processing Detail

The complete procedural activities related to this component are as follow;

1. User/client requests a page from the system through the internet
2. Server captures the request successfully
3. Server evaluates this request inside
4. Server gets necessary information from data storage component
5. Server returns information as output
6. Client side takes information successfully
7. Client evaluates the server’s output
8. Client creates webpage dynamically and show to user

#### 5.2.1.4 GUI Dynamic Behavior

This component has relation with authentication and user components. This component interacts with authentication component as authentication component calls this component. User component also calls this component to show itself on webpage. This component depends on receiving information from these two components.



**Figure: Sequence Diagram of GUI**

### 5.2.2 Authentication

This component provides to separate people who have permission to enter system and also separate people who are administrator.

#### 5.2.2.1 Processing Narrative for Authentication

This component is responsible for checking personal requests with the permission of the clients. This prevents people who are not related with the system. This is implemented as username and password. At this point, everybody who is related with system have unique username and password. On the other hand, this component separates profile of people who is related with system.

#### 5.2.2.2 Authentication User Interface

This has two areas. First one is username, second one is password. Also there is log in button under these two text boxes. Log in button sends all information in the text box to server side to check. Output depends on whether information is correct or not. User can go next step or try again.

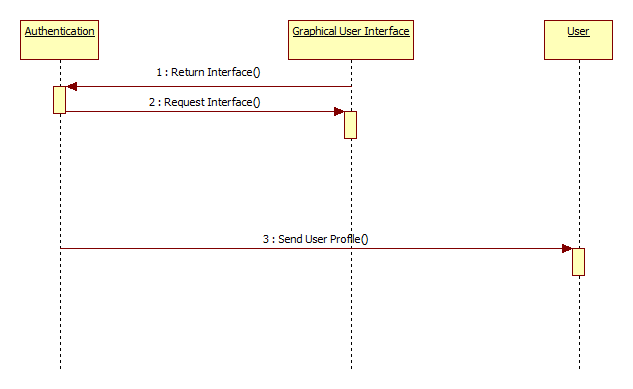
#### 5.2.2.3 Authentication Process Detail

The complete procedural activities related to this component are as follow;

1. User/client fills the username and password area
2. User/client clicks the log in button under this area
3. Client side sends these information to server side to check
4. Server side takes these information successfully
5. Server side check information from database
6. Server side return different information stack whether correct or not
7. Client side gets information successfully
8. Client side interprets received information
9. Client side create dynamically webpage according to received information
10. User see the desired webpage

#### 5.2.2.4 Authentication Dynamic Behavior

This component has relation with GUI component and user component. This calls GUI component to show itself as webpage. On the other hand, this component directs client to user component according to receiving information from server side.



**Figure: Sequence Diagram of Authentication**

### 5.2.3 User

#### 5.2.3.1 Processing Narrative for User

This component is responsible for sending requests to Data Retrieval. Only the authenticated components become user components. It has 2 kinds of sub-components as administrator and user. User component has corresponding back end applications. It acts as a bridge between back end applications and data retrieval. User can request a data from Data Retrieval.

#### 5.2.3.2 User Interface Description

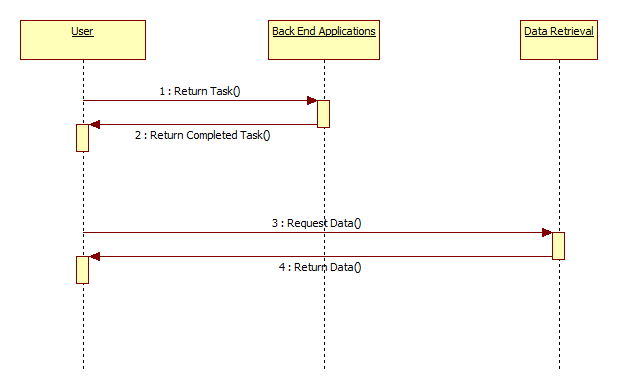
It generates data requests for Data Retrieval. By using back end applications requests are processed with corresponding program.

#### 5.2.3.3 User Processing Detail

It works as follows;

1. It generates requests for loading from or storing to database by using backend applications.
2. Results of requests are returned to user component from Data Retrieval.

#### 5.2.3.4 User Dynamic Behavior



**Figure: Sequence Diagram of User**

### 5.2.4 Back End Applications

#### 5.2.4.1 Processing Narrative for Back End Applications

This component is for handling different tasks using technologies available. These technologies include ASP.net, JavaScript, HTML and CSS.

#### 5.2.4.2 Back End Applications Interface Description

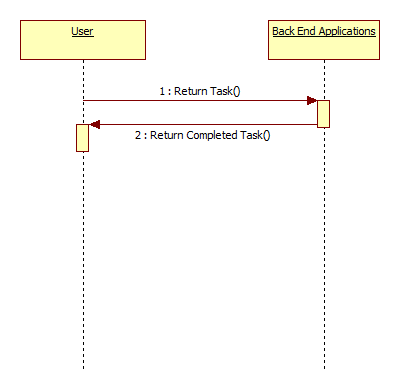
It generates result for User using the User’s request as input and produces output.

#### 5.2.4.3 Back End Applications Processing Detail

It works as follows;

1. User requests a task and triggers an appropriate task for back end application.
2. The application returns processed task’s result to user.

#### 5.2.4.4 Back End Applications Dynamic Behavior



**Figure: Sequence Diagram of Back End Applications**

### 5.2.5 Data Retrieval from Data Storage

#### 5.2.5.1 Processing Narrative for Data Retrieval from Data Storage

Data Retrieval is responsible for accessing data from Data Storage. It provides a connection between user and database.

#### 5.2.5.2 Data Retrieval from Data Storage Interface Description

It receives data requests from users of the system. Then, these requests are converted into SQL commands and sent to Data Storage. The result obtained from database is reported to user or component which sent the request.

#### 5.2.5.3 Data Retrieval from Data Storage Processing Detail

It works as follows;

1. Receive a request from User component.
2. Request is converted into SQL commands.
3. Send commands to Data Storage
4. Received object from Data Storage is reported to the user or component which sent the request.

#### 5.2.5.4 Data Retrieval from Data Storage Dynamic Behavior

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**Figure: Sequence Diagram of Data Retrieval from Data Storage**

### 5.2.6 Data Retrieval from Beagle Board

#### 5.7.2.1 Processing Narrative for Beagle Board from Beagle Board

Data Retrieval is responsible for accessing data which contains current information of home appliances from Beagle Board. It provides a connection between user and Beagle Board.

#### 5.2.6.2 Data Retrieval from Beagle Board Interface Description

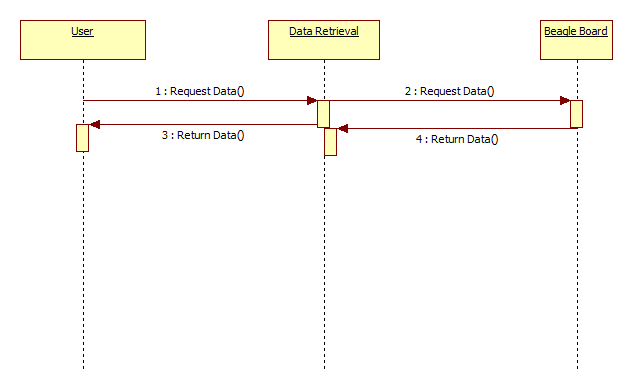
It receives data requests from users of the system. Then, these requests are sent to Beagle Board. The result obtained from Beagle Board is reported to user or component which sent the request.

#### 5.2.6.3 Data Retrieval from Beagle Board Processing Detail

It works as follows;

1. Receive a request from User component.
2. Send commands to Beagle Board
3. Received object from Beagle Board is reported to the user or component which sent the request

#### 5.2.6.4 Data Retrieval from Beagle Board Dynamic Behavior



**Figure: Sequence Diagram of Data Retrieval from Beagle Board**

### 5.2.7 Data Storage

#### 5.2.7.1 Processing Narrative for Data Storage

Data Storage component is responsible for creating and storing data objects. It provides the data which is requested from Data Retrieval.

#### 5.2.7.2 Data Storage Interface Description

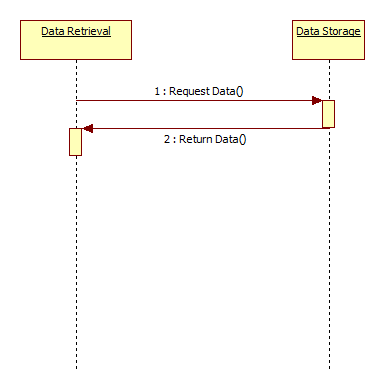
Data Retrieval sends data requests to Data Storage for further processing. Then, Data Storage processes these commands and return the results of these queries.

#### 5.2.7.3 Data Storage Processing Detail

It works as follows;

1. Receive a data request from Data Retrieval component.
2. Converted SQL queries are processed.
3. Results of queries are returned.

#### 5.7.2.4 Data Storage Dynamic Behavior



**Figure: Sequence Diagram of Data Storage**

### 5.2.8 Beagle Board

#### 5.2.8.1 Processing Narrative for Beagle Board

Beagle Board is responsible for receiving data from home appliances and either sending them to user or storing them to Data Storage. It provides connection between home appliances.

#### 5.2.8.2 Beagle Board Interface Description

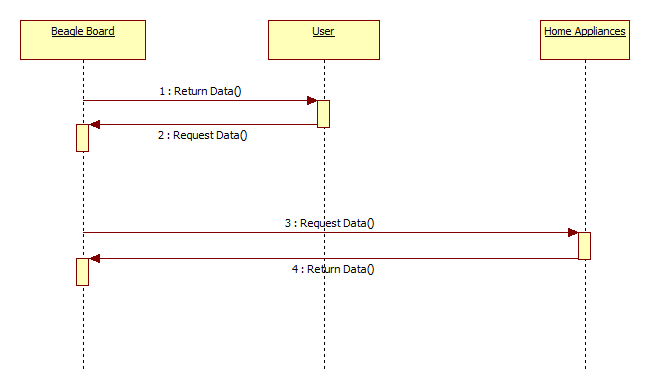
According to time or user request, Beagle Board sends data request to home appliances. Returning data will send to either user or Data Storage.

#### 5.2.8.3 Beagle Board Process Detail

It works as follows;

1. Receive data request or interrupt from timer
2. Request data from home appliances
3. Send received data accordingly

#### 5.2.8.4 Beagle Board Dynamic Behavior



**Figure: Sequence Diagram of Beagle Board**