Sentinel Web: Implementation of Laravel Framework in Web Based Temperature and Humidity Monitoring System

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***Abstract*—The performance of information technology infrastructure is influenced by environmental parameters, such as temperature and humidity. Therefore, there is a need to precisely monitor and handle such parameters. This paper presents the development of a reliable web based monitoring system as online application media to simplify recapitulation and documentation of temperature and humidity data. To fasten web development, it needs an implementation of web technology such framework. In developing application, Laravel MVC framework was employed as scripting method and object-oriented-based UML. Sentinel web offers stakeholder to monitor the latest data, review and download data by certain date range, make system error reporting document, and manage users and profile.**

***Keywords*—web, temperature humidity monitoring, Laravel**

I. INTRODUCTION

Information technology is implementation of computer system and electronic device which is functioned as storage, retrieval, sender, and manipulation of data [1]. Development of information technology is influenced by infrastructure role which need monitoring system. As internet technology growing rapidly, information now can be accessed easily through web or online. Therefore, information technology cooperation use web to maintain their infrastructure parameter online. For simple example, this paper works on two parameters that used generally, temperature and humidity.

Foundation of writing this paper is to design a Sentinel web for temperature and humidity monitoring system by implementing Laravel framework as web technology for scripting. Laravel is one of frameworks for web application with expressive and elegant syntax and gives solution for development by facilitating general task in most big web project [2]. Laravel was chosen because it has a number of helpful functions like Bundle, Eloquent ORM, Application Logic, Reverse Routing, Class Auto Loading, etc [2]. Implementation of Laravel framework is based on the last research in which web technology has not applied yet. Exploration of Laravel framework in this paper covers implementation of MVC concept, Eloquent ORM, Blade Templating, as well as installation of Bundles which supports system function.

In this paper, methods to build the Sentinel web will be presented through the object oriented modeling diagram. UML was chosen as modeling tool, since it is the one of the up-to-date modeling language to describe how to build software.

II. RELATED WORKS

Research of web based temperature and humidity monitoring system becomes popular these days. Its development grows fast as technology grows following internet need.

First research is Temperature and Humidity Acquisition System in Server Room by Awaj. Web based application was built by simple HTML page. Its system only has function as acquisition data viewer [3]. There is neither authentication nor documentation to be offered.

Second, Prototype Device of Web Based Temperature and Humidity Acquisition by Vitallenko. This web based application has visual basic as fetching data application. Meanwhile, development of web is only simple HTML without any web technology implementation [4].

Third, Development of Embedded Gateway for Wireless Sensor Network and Internet Protocol Interoperability by Wibowo et al. Web based application was developed by PHP and Javascript. For scripting a responsive page, it uses HTML5 and CSS3 with the help of Bootstrap library. It implements AJAX to make dynamic page [5].

From the last web application above, there are some weaknesses that exist and need to be solved. Such as there is no web technology framework implementation yet in the building of web as viewer of temperature and humidity data. Web based system need recapitulation chart and document for certain date range data. Error reporting document is important especially when system experience failure work. There has not been profile management for each user account.

III. SYSTEM DESIGN

In this paper, Sentinel web system design will be presented through object oriented based UML. UML is a method to modeling diagram and object oriented application design from IBM [6]. Types of UML diagram,

according to Whitten Bentley, are use case diagram, activity diagram, class diagram, object diagram, composite structure diagram, sequence diagram, deployment diagram. Use case diagram describe how system interacts with user. Activity diagram describes array flow of use case business process. Class diagram will explain how the object' classes are arranged as relation among them. Object diagram has similarity with class diagram, but it is specified at describing objects of classes, modeling the real object instance with current attribute value. Composite structure diagram draws the structure inside of object, component, or use case. Sequence diagram explains how the objects interact each other through message. Deployment diagram gives description about software component inside physical architecture in hardware system node [7]. Four UML Diagram types chosen in this paper are use case diagram, class diagram, deployment diagram, activity diagram. Other complementary diagram is user interface.

A. Use Case Diagram

The use case diagram in Figure 1 shows that there are three roles in this Sentinel web. User is a parent role for administrator and super administrator role. User role is allowed to monitor latest data, to manage site and profile, and to acquire information of other user. Whether administrator role is allowed to add user and manage user data. Then, super administrator role has access to manage groups and activate or deactivate user.

B. Class Diagram

Class diagram of Sentinel web, shown in Figure 2, consist of two parts. First diagram describe classes in Controller. Then second one is describing classes in Model. Controller class has function to control how information will flow after brought by Model. Controller class diagram has 12 classes that are connected in certain path. SearchController, UserController, UserGroupsController, SiteController, ReportController, LogController, Profile Controller were generalization from AdminController. Admin Controller, HomeController, AuthController were generalization from BaseController. BaseController itself was generalization from Controller class, where all the basic Controller usage from Laravel framework created. Model class divided into User, UserGroup, Group, Report, Trigger, Data, Site, and Eloquent. The main class in Model class is Eloquent, which is an ORM in this framework. Other mentioned classes were the generalizations of Eloquent. This Model class has main role in defining type of data will be fetched from database. In other part, Model also describes insert validation of data before record it into database.

C. Deployment Diagram

The deployment diagram is shown in Figure 3. There are three device nodes in there; server, embedded system, and user. Server node contains of socket application, MySQL database, and web application execution environment nodes. Web application node divides by Laravel framework artifact and Apache component. Inside Laravel framework, seven artifacts exist and interacts each other. MVC (Model View Controller) artifact communicates with Query, Routing, and Apache artifact to build database. While View organize user interface with the help of <style>.css, <script>.js and <view>.blade.php. In user node, they need web browser as artifact node.

D. Activity Diagram

Actually there are more than ten of activity diagram to construct this web. Main three activity diagram were chosen to simplify the explanation. Figure 4 show the three activity diagram. First activity diagram in Figure 4(a) is login activity. Login activity started with opening login page. As page loaded, user can input their username and password there. If user passes validation, home page will loaded. If user fails, they will back to login page and see error message. Figure 4(b) describes monitor latest data activity. In home page, user can monitor the latest data. When reload time reached, data inside table will be updated following the latest data in the database. Then review site data activity described in Figure 4(c). In this review page, user can load data from certain date range, ip, and id. Sentinel web provide information if data requested in database available. If unavailable, system logically generates empty data.

E. User Interface

User interface of Sentinel web described through one screenshot in Figure 5. Bootstrap framework, Ajax, and Jquery help to build this user interface. Sentinel web has six menus. It derives from Home, Setting, Review, Report, Users, and Account. Home page will generate the latest monitoring data. Setting page provide page to set site properties. Review page help user to make recapitulation of certain data properties. Report page can automatically download our error report to pdf version document. In Users page, user can see other user profile. Account page show user information page that displayed to other users.

IV. TESTING RESULT

Web test is aimed to investigate how much the system will survive in certain parameter testing. There are three tests conducted in this study, i.e. test on display resolustion of access device, test on web function using various desktop browsers, and test on web function using various mobile devices. Testing result is displayed in Table I. to Table III.

A. Test on Display Resolution of Access Device

Table I. shows the result of testing on display resolution of access device. It's divided into nine resolutions.

TABLE I. TESTING RESULT ON DIPLAY RESOLUTION OF ACCESSING DEVICE

Resolution	Size (pixel x pixel)	Display	Result
HVGA	320x480	Mobile device	Not success
WVGA	480x800	Mobile device	Success
DVGA	640x960	Mobile device	Success
WXGA	768x1280	Mobile device	Success
XGA	1024x768	Desktop	Success

Resolution	Size (pixel x pixel)	Display	Result
WXGA	1366x768	Desktop	Success
WXGA	1280x800	Desktop	Success
SXGA	1280x1024	Desktop	Success
WSXGA	1680x1050	Desktop	Success

The testing result on display resolution of accessing device shows this web achieved 88% success. The result shows not success in HVGA 320 pixel x480 because the display cannot load table well.

B. Test on Web Function Using Various Desktop Browser

Testing result of the web function using various browsers can be depicted in Table II. There are four browsers which perform each function of the web. It's Chrome, Opera, Firefox, and Safari.

TABLE II. TESTING RESULT ON WEB FUNCTION USING VARIOUS DESKTOP BROWSER

Function	Browser			
	Chrome	*Opera*	*Firefox*	*Safari*
Login	success	success	success	success
Monitor latest data	success	success	success	success
Review site data	success	success	success	success
Create and edit site	success	success	success	success
Search site	success	success	success	success
Delete site	success	success	success	success
Print last data and chart	success	success	success	success
View user and profile	success	success	success	success
Print error report	success	success	success	success
Edit profile	success	success	success	success
Send email to user	success	success	success	success
Create and edit user data	success	success	success	success
Delete user data	success	success	success	success
Create and edit groups	success	success	success	success
Search group	success	success	success	success
Delete user groups	success	success	success	success
Activate or deactivate user	success	success	success	success
Logout	success	success	success	success

The testing result on web function using various desktop browsers achieved 100% success. The browsers safari, opera, chrome, and firefox can load all the web function well. Besides Laravel framework to facilitate scripting function, the web supported by Bootstrap to support display.

C. Test on Web Function Using Various Mobile Device

Table III. indicates the result of testing function using various mobile device. Three operating system chosen in the following table are iOS, Android, and Windows Phone.

TABLE III. TESTING RESULT ON WEB FUNCTION VARIOUS MOBILE DEVICE

Function	Operating System		
	iOS	*Android*	*Windows Phone*
Login	success	success	success
Monitor latest data	success	success	success
Review site data	success	success	success
Create and edit site	success	success	success
Search site	success	success	success
Delete site	success	success	success
Print last data and chart	success	success	success
View user and profile	success	success	success
Print error report	success	success	success
Edit profile	success	success	success
Send email to user	success	success	success
Create and edit user data	success	success	success
Delete user data	success	success	success
Create and edit groups	success	success	success
Search group	success	success	success
Delete user groups	success	success	success
Activate or deactivate user	success	success	success
Logout	success	success	success

The testing result on web function on various mobile devices achieved 100% success. Laravel and Bootstrap collaborate well although each mobile device browser has different benchmark score.

V. CONCLUSION AND FUTURE WORK

Implementation of technology, especially web framework, simplifies steps to developing application. Monitoring, documentation, recapitulation, and reporting will be something really important in the future, therefore this paper describe on much how to display the latest data and review the last data. This Sentinel web has been tested in resolution, various web browser, and platform. In resolution test, this web achieved 88% accuracy, which is fairly high, although not 100%. It is caused by incapability of displaying full table in that resolution range. Whether in other tests, Sentinel web presents 100% success. This web still lack on exploiting web technology and Laravel framework feature. The improvement and development in the future are needed, such as the implementation of SMS alarm, unique identity authentication, and addition of parameters.

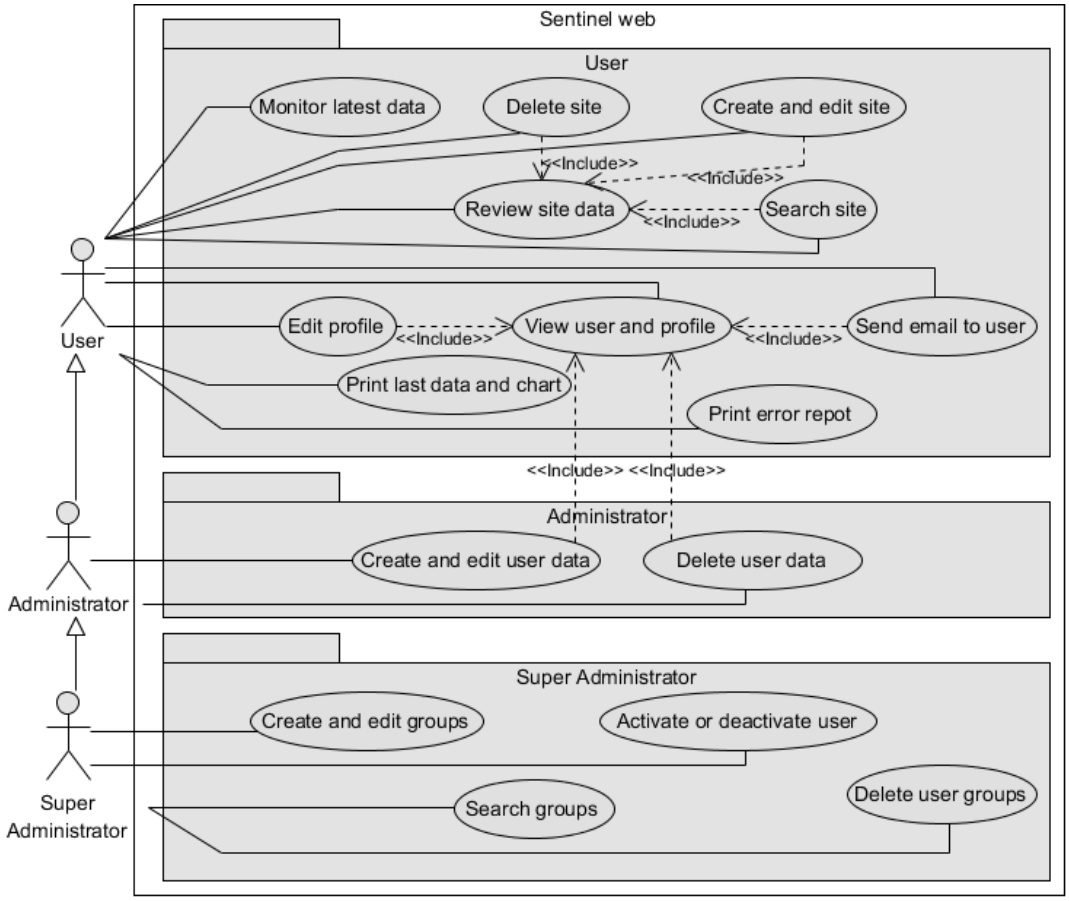
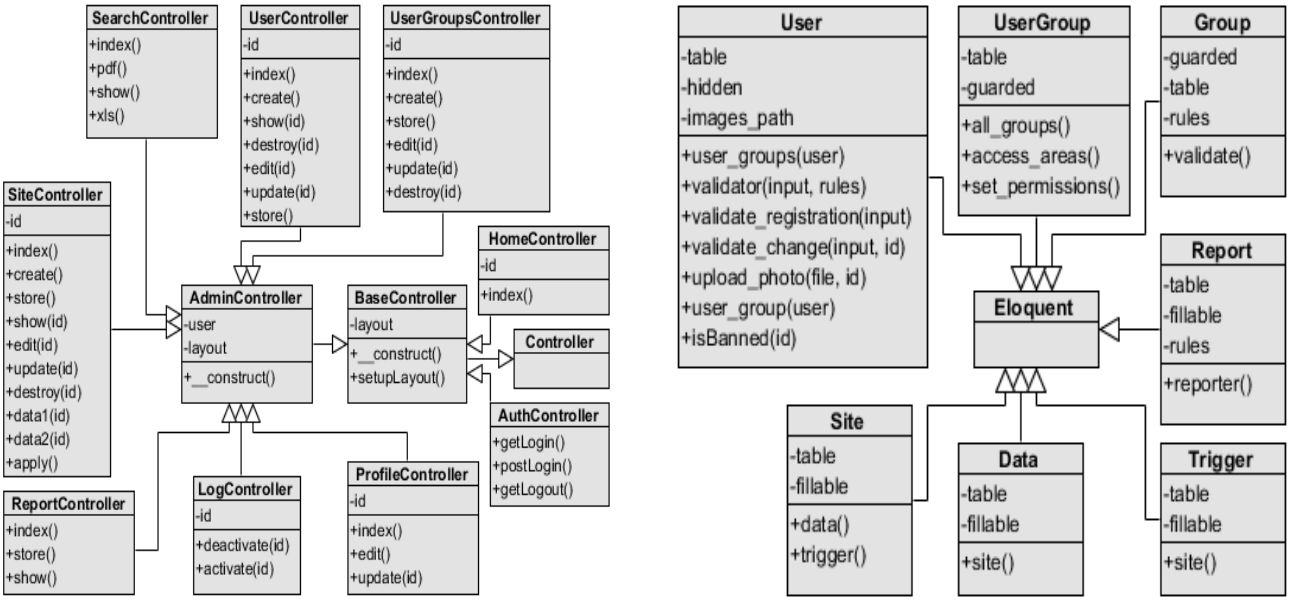


Figure 1. Sentinel Web Use Case Diagram



(a) Controller

(b) Model

Figure 2. Sentinel Web Class Diagram

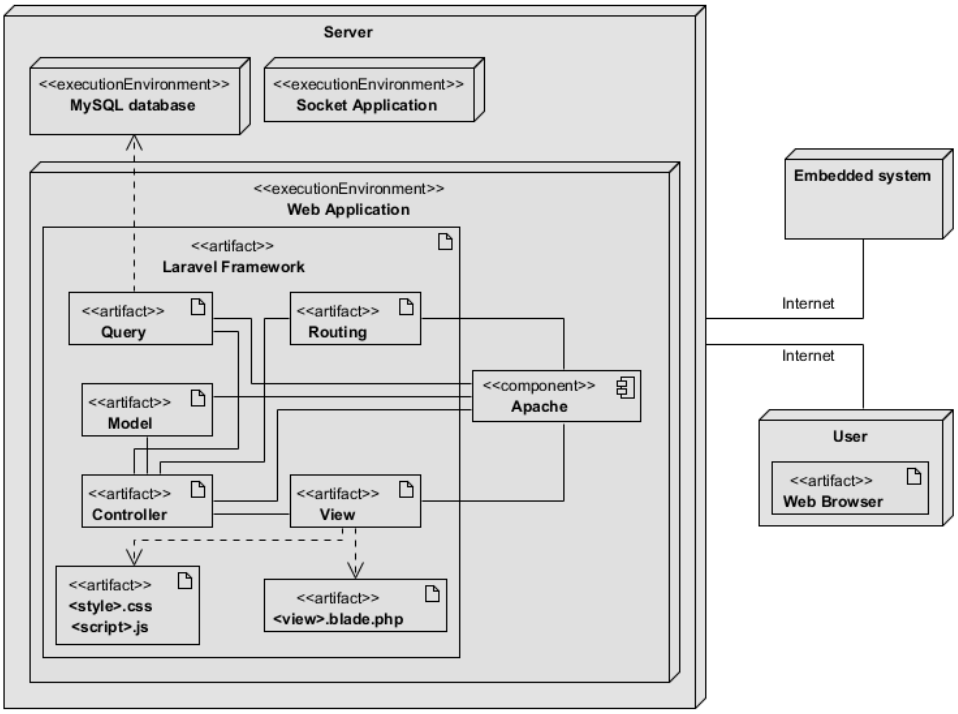
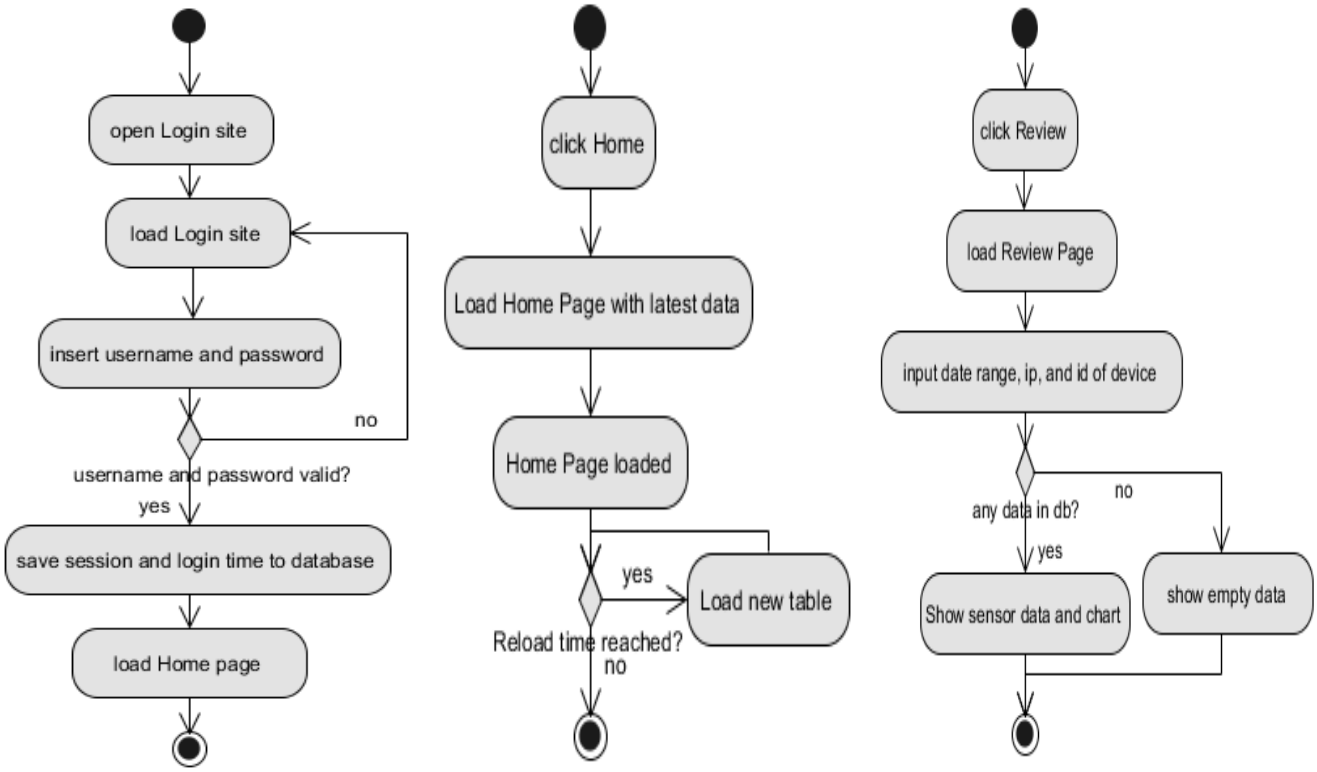


Figure 3. Sentinel Web Deployment Diagram



(a) Login (b) Monitor latest data (c) Review site data

Figure 4. Sentinel Web Activity Diagram

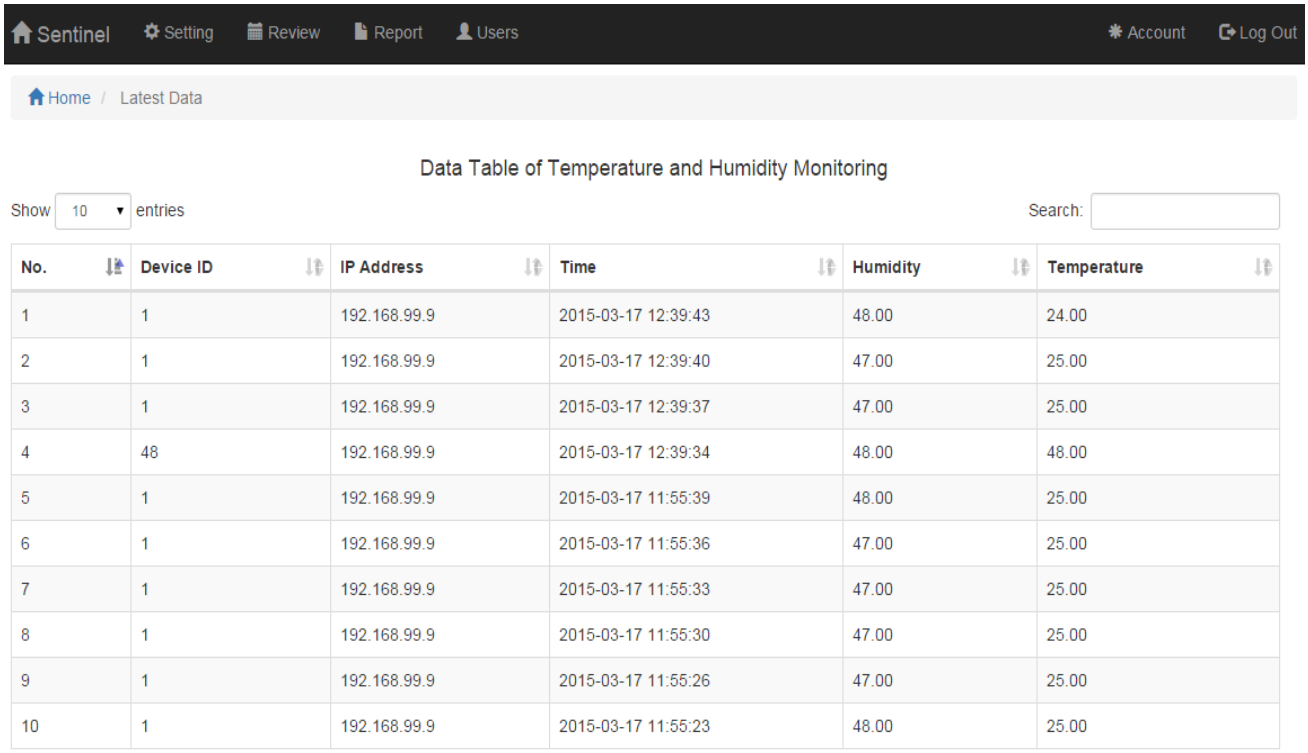


Figure 5. Sentinel Web User Interface

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