Functional Requirements Specification and User

Interface Specification of Temperature Sensor System

Eric Kreider

Department of Computer Science and Informatics, Indiana University of South Bend

System Implementation

Professor Shawn Dai

February 6th, 2022

The project has many stakeholders associated with it. Primarily, the stakeholders involved will be the members of the quality assurance team, the company as a whole, the support teams, and the customer. The quality assurance team has a direct interest in the project and their department is directly financing it. They are interested because they will be interacting with the system frequently and directly. The company as a whole is interested in the system because the company wishes to deliver a safe and quality product. For them, quality assurance is a portion of the product itself and by uplifting that area it uplifts the entire product. The customer is interested in the system even though they will never see it because the customer wants a product they can trust. They are not interested in the how, but instead in the end result. Lastly, the support teams are interested in the system because they will be involved in maintaining it. This team involves IT support staff and application administrative staff. They want the product to be simple to configure and easy to deploy. A troublesome system might be good for the quality assurance team, but if it is a drain on IT and support then other information systems may suffer.
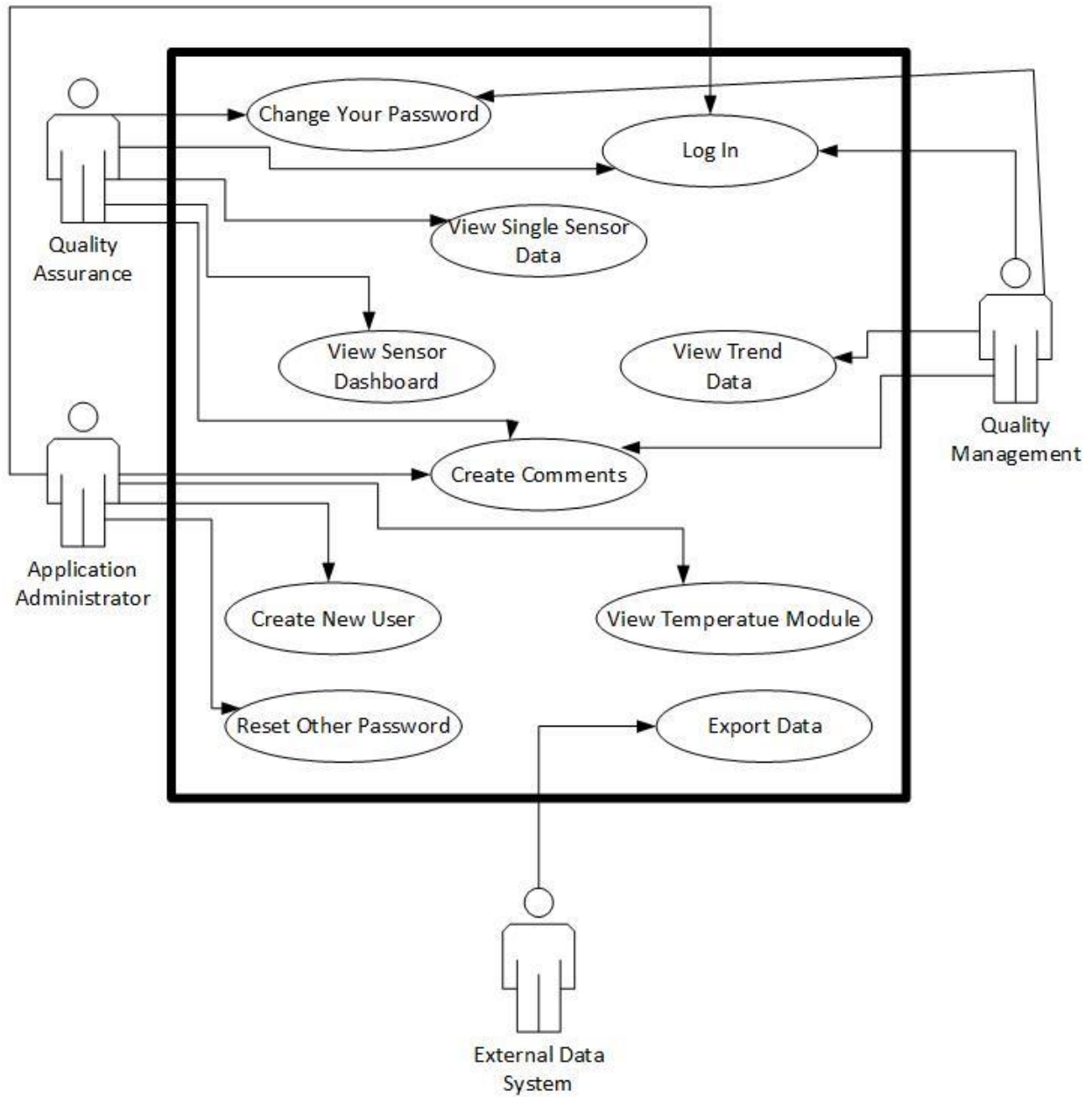
There are three primary actors within the system, with a possibility for a fourth. The system can be deployed as a stand-alone system in which all the data is contained to the temperature sensor system. In this case, the three actors involved with the system would be the quality management users, the quality assurance users, and the administrative users. The quality management users are those that deal with more big picture discussions of product quality: trends and movement over time. They may interact with the system less frequently. Quality assurance users are those that are likely to interact with the system on a daily basis. These are users who are interested in what is happening right now and accurate and rapid reporting are important to them. Lastly, administrative users are users who are associated with the system but do not fulfill a quality role. They may be IT support staff, or application points of contact that help configure the system. For them, maintaining the system is important. If the system is deployed within an environment with an existing database structure, a fourth actor can exist. Data can be pulled from the temperature sensor system into the business' existing database systems, which would function as a fourth actor. For this report, that option will not be expanded upon because the database to database connection can take place similarly to the existing database to webpage connection that will be implemented and requires additional knowledge of a business' database infrastructure to implement. If a company has it, they can use existing SQL accounts within the database to connect to it or a new account can be configured specifically for that purpose.

There are a number of use cases associated with the system and the different actors:

- Look at single current sensor data – this should be very current data that allows for monitoring of current quality levels
- Look at sensor data over time – look at sensor data overtime to establish trends
- Create a new user – create a new user and give them access to the sensor data
- Reset user password – reset the password for a webpage user
- Change own password – reset the password for a user's own account
- Look at sensor module data – verify the module running the temperature and humidity reporting is functioning correctly
- Look at all current sensor data – view a dashboard of all sensors running with current data

- Create comments – users should be able to add comments to the page that others can see in order to communicate
- Log In – authenticate into the system
- Export data to external data system – Export data to other system not involved with Temperature Sensor System, such as another SQL database

Temperature Sensor System - Use Case Diagram

Change Your Password

Log In

View Single Sensor Data

View Sensor Dashboard

View Trend Data

Create Comments

Create New User

View Temperatue Module

Reset Other Password

Export Data

Quality Assurance

Application Administrator

Quality Management

External Data System

Traceability Matrix and Fully-Dressed Use Cases

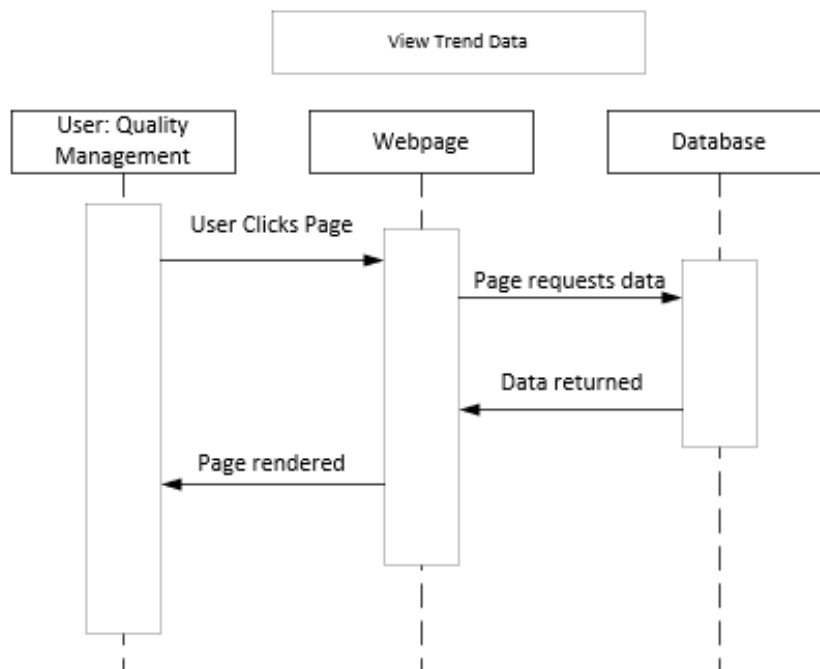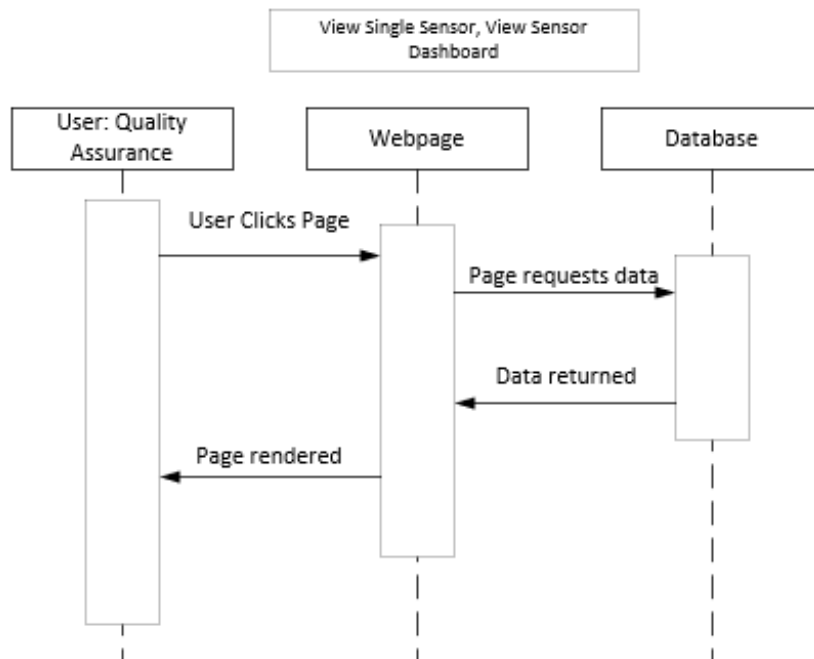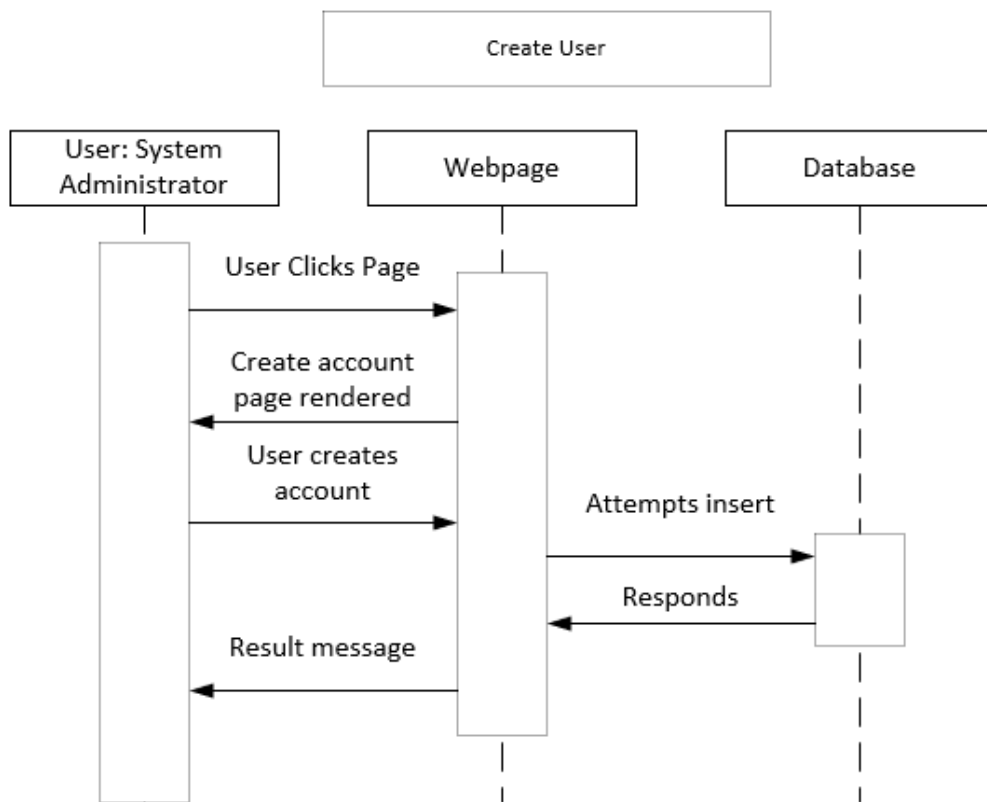| Traceability Matrix			
Use Case	System Requirement Number	Actor	Weighed Priority
View Single Sensor Data	REQ-1	Quality Assurance	20%
View Sensor Dashboard	REQ-1	Quality Assurance	20%
Export Data	REQ-2	External Data Systems	5%
View Trend Data	REQ-3	Quality Management	20%
Log In	REQ-4	All	5%
Change Your Password	REQ-4	All	5%
Create New User	REQ-4	Application Administrator	5%
Reset Other Password	REQ-4	Application Administrator	5%
View Temperature Modules	REQ-4	Application Administrator	5%
Create Comments	REQ-5	All	10%

Name of Use Case:	View Single Sensor
Actor:	Quality Assurance
Description:	View current data associated with single sensor
Successful Completion:	1. User signs in 2. User navigates to correct page 3. Data is available
Alternative:	1. User signs in 2. User lacks access
Precondition:	Temperature data flow is on
Postcondition:	User can view other pages
Assumptions:	User has an active account, account is Quality Analyst

Name of Use Case:	View Sensor Dashboard
Actor:	Quality Assurance
Description:	View all current temperature data within a dashboard
Successful Completion:	1. User signs in 2. User navigates to correct page 3. Data is available
Alternative:	1. User signs in 2. User lacks access
Precondition:	Temperature data flow is on
Postcondition:	User can view other pages
Assumptions:	User has an active account, account is Quality Analyst

Name of Use Case:	View Trend Data
Actor:	Quality Management
Description:	View trend data for all sensors
Successful Completion:	1. User signs in 2. User navigates to correct page 3. Data is available
Alternative:	1. User signs in 2. User lacks access
Precondition:	Temperature data flow is on
Postcondition:	User can view other pages
Assumptions:	User has an active account, account is Quality Management

System Sequence Diagrams

View Single Sensor, View Sensor Dashboard

User: Quality Assurance	Webpage	Database

- User Clicks Page →
- Page requests data →
- ← Data returned
- ← Page rendered

View Trend Data

User: Quality Management	Webpage	Database

- User Clicks Page →
- Page requests data →
- ← Data returned
- ← Page rendered

```
                    ┌─────────────────────────────┐
                    │         Create User         │
                    └─────────────────────────────┘


┌──────────────────┐    ┌──────────────────┐    ┌──────────────────┐
│  User: System    │    │     Webpage      │    │     Database     │
│  Administrator   │    │                  │    │                  │
└──────────────────┘    └──────────────────┘    └──────────────────┘
```

User Clicks Page

Create account page rendered

User creates account

Attempts insert

Responds

Result message

User Interface Specification

Log in Screen:

Welcome to the Quality
Temperature Reporting
System

Username: [   ]

Password: [   ]

Sign In

Quality Analyst Sensor Dashboard:

| View Comments | Change Password | Sign Out |

Welcome, Quality Analyst

Click on a specific sensor to
learn more:

Sensor 1

Temperature: 75 degrees
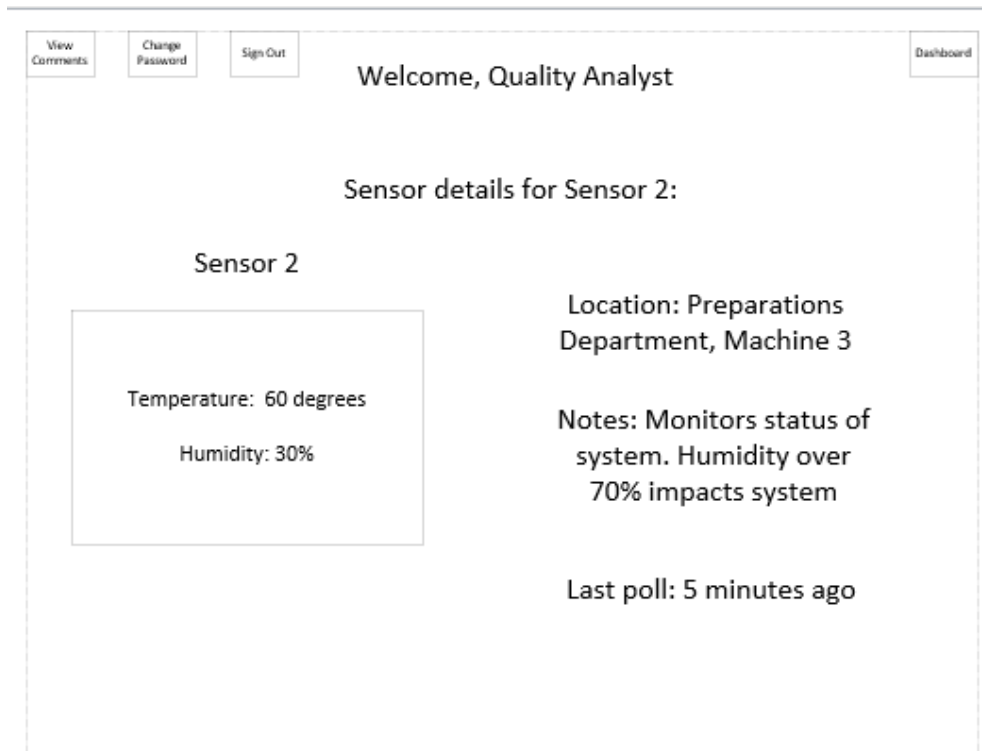
Humidity: 50%

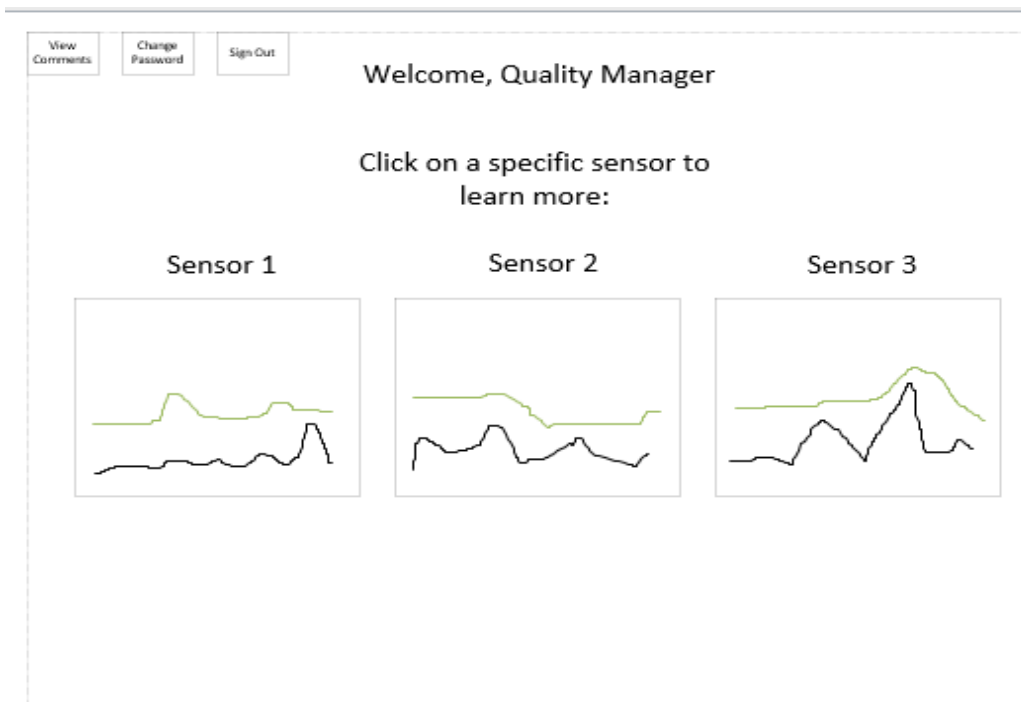Sensor 2

Temperature: 60 degrees

Humidity: 30%

Sensor 3

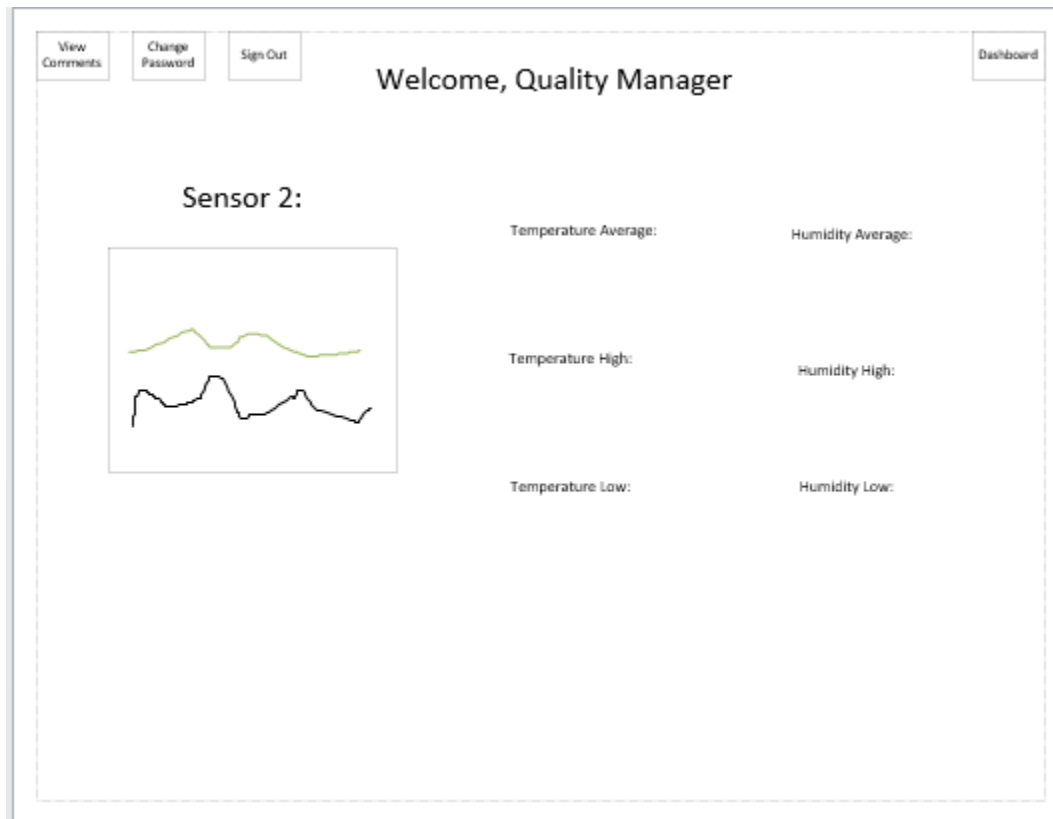Temperature: 110 degrees

Humidity: 20%

Quality Analyst Single Sensor Data:

View Comments | Change Password | Sign Out | Dashboard

Welcome, Quality Analyst

Sensor details for Sensor 2:

Sensor 2

Temperature: 60 degrees

Humidity: 30%

Location: Preparations Department, Machine 3

Notes: Monitors status of system. Humidity over 70% impacts system

Last poll: 5 minutes ago

Quality Management Dashboard:

View Comments | Change Password | Sign Out

Welcome, Quality Manager

Click on a specific sensor to learn more:

Sensor 1   Sensor 2   Sensor 3

Single Sensor Trend

View Comments | Change Password | Sign Out | Dashboard

Welcome, Quality Manager

Sensor 2:

Temperature Average: Humidity Average:

Temperature High: Humidity High:

Temperature Low: Humidity Low:

Change Password:

View Comments | Sign Out | Dashboard

Welcome, User:

Enter a new password:

Re-enter the password:

Submit

Add a Comment:

Welcome, User:

User   Comment

Enter a new
comment:

Submit

Reset other password:

Welcome, System Analyst:

Enter a user to reset:

User

New password

Reenter
password

Submit

User Effort Estimation

The system is primarily designed for rapid delivery of information to end users. As such, most use cases should be relatively fast. Most actions done by quality analysts and quality managers should only take a few clicks and for some use cases all they will need to do is log in.

Use case: View Single Sensor Data

- A user will navigate to the web screen and receive a log in prompt. The user will click on the textbox for their username and enter it, then the one for their password and enter it. Then they will click submit. They will land on the sensor dashboard page. They will then click on the sensor they want to view and it will be presented to them. They will make four total mouse clicks and will make a number of keyboard strokes equivalent to the length of their username and password.

Use case: View Trend Dashboard

- A quality management user will navigate to the web screen and receive a log in prompt. The user will click on the textbox for their username and enter it, then the one for their password and enter it. Then they will click submit. They will land on the sensor trend dashboard page. They will make three total mouse clicks and will make a number of keyboard strokes equivalent to the length of their username and password.

Use case: Change Own Password

- A user will navigate to the web screen and receive a log in prompt. The user will click on the textbox for their username and enter it, then the one for their password and enter it. Then they will click submit. They will land on the sensor dashboard page. From there, the user will click on the password change button. Then they will click on the textbox to enter a password and enter a new password. Then they will click on the second password box and reenter it to confirm. Finally, they will click submit and have their password changes. The total number of clicks is 7 and the number of keyboard strokes is equivalent to their username and password plus their new password twice.