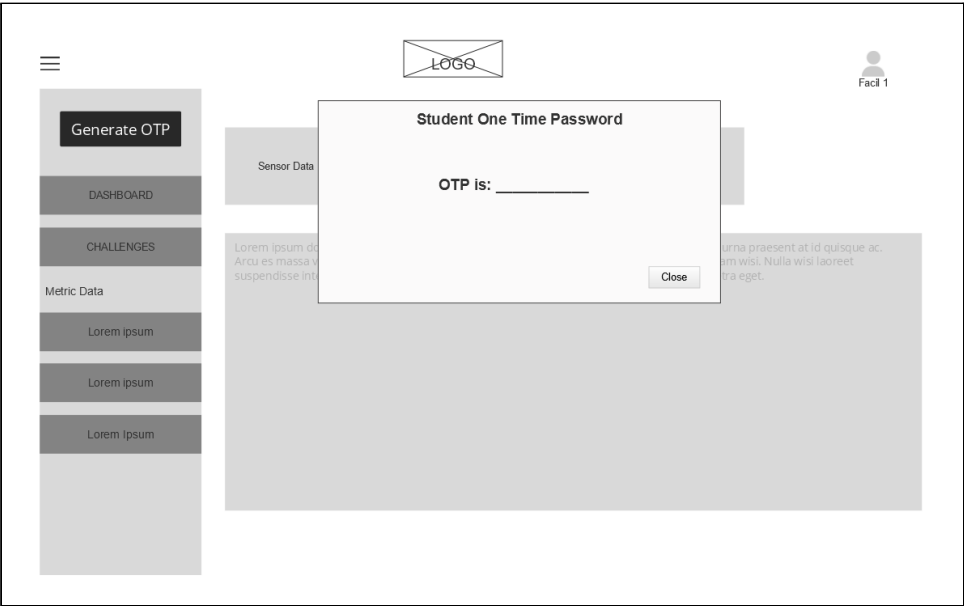


```

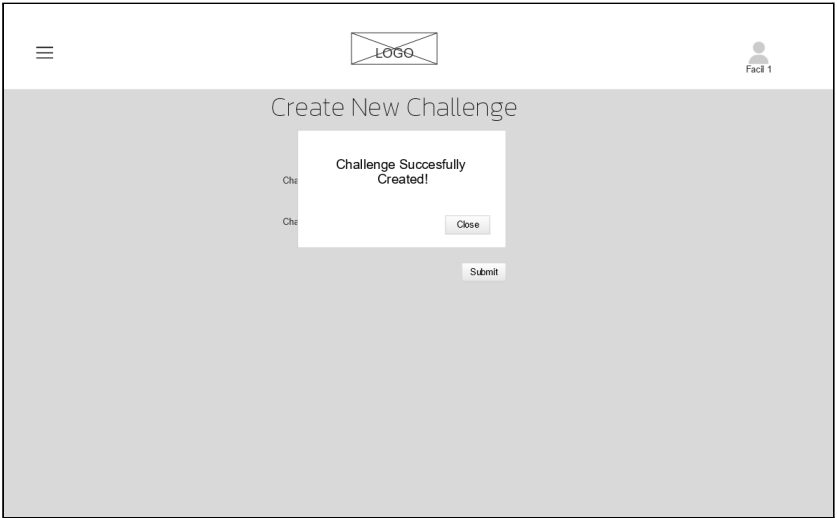

    graph TD
      Start(( )) -- openApp() --> Login
      subgraph "App in foreground"
        Login -- "loginStudent(otp)[!isValid]/displayError()" --> Login
        Login -- "loginFacilitator(password)[!isValid]/displayError()" --> Login
        Login -- "loginFacilitator(password)[isValid]/navToFacilitatorDashboard()" --> FacilitatorDashboard
        Login -- "loginStudent(otp)[isValid]/navToDashboard()" --> Dashboard
        Dashboard -- "back()" --> Login
        Dashboard -- "displayTut()" --> Tutorial
        Dashboard -- "displayChalList()" --> ChallengeList
        ChallengeList -- "back()" --> Dashboard
        ChallengeList -- "displayChalScreen(id)" --> ChallengeGameScreen
        ChallengeGameScreen -- "[chalComplete == true] / displayChalEnd()" --> ChallengeEnd
        ChallengeEnd -- "back()" --> Dashboard
        FacilitatorDashboard -- "back()" --> FacilitatorChallengeList
        FacilitatorDashboard -- "displayChalList()" --> FacilitatorChallengeList
        FacilitatorChallengeList -- "delChal(id)/displaySuccess()" --> FacilitatorDashboard
        FacilitatorChallengeList -- "displayAddChal()" --> AddChallenge
        AddChallenge -- "addChal(name, checkpoint, map) [!validateChallengeName || !validateCheckpointValue || !validateMapFileType] / displayError(msg)" --> AddChallenge
        AddChallenge -- "addChal(name, checkpoint, map) [validateChallengeName && validateCheckpointValue && validateMapFileType] / displaySuccess() && displayChalList()" --> FacilitatorChallengeList
        FacilitatorChallengeList -- "closeApp()" --> End(( ))
        AddChallenge -- "closeApp()" --> End
        DisplayOTP -- "closeModal()" --> FacilitatorDashboard
        DisplayOTP -- "closeApp()" --> End
      end
  
```

1.2 System Test Cases (User Acceptance Test)

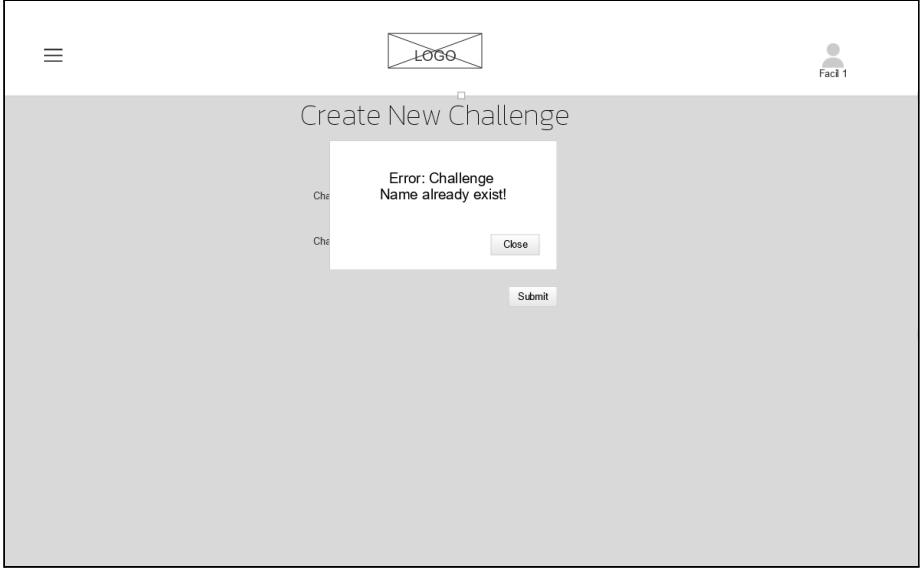
1.2.1 Generate One-Time Password

System Test Identifier	ST1
Relevant Use Case ID	UC11
System Test Name	Generate One-Time Password
Preconditions	<ol style="list-style-type: none"> 1. Tester is signed in as Facilitator 2. Tester is on the Facilitator Dashboard page
Steps	<ol style="list-style-type: none"> 1. Click on "Generate OTP" button 2. Observe screen
Expected Result	 <p>The screenshot shows a web application interface. On the left is a sidebar menu with items: 'Generate OTP' (highlighted), 'DASHBOARD', 'CHALLENGES', 'Metric Data', and three 'Lorem Ipsum' entries. The main content area has a 'Sensor Data' section and a large text block. A modal window titled 'Student One Time Password' is open in the center, containing the text 'OTP is: _____' and a 'Close' button. The top of the page features a 'LOGO' placeholder and a user profile icon labeled 'Fac11'.</p>
Actual Result	
Pass/Fail	

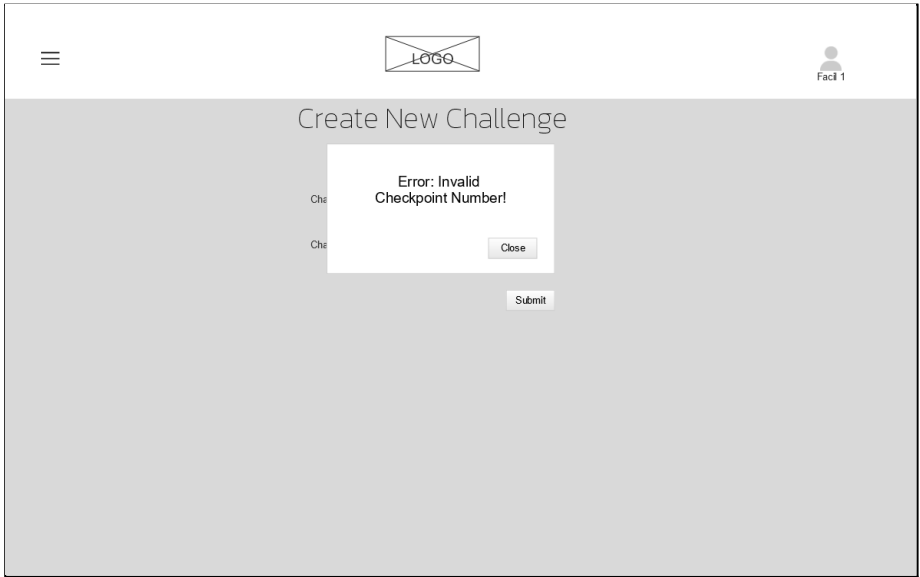
1.2.2 Add New Challenge

System Test Identifier	ST2
Relevant Use Case ID	UC13
System Test Name	Add New Challenge
Preconditions	<ol style="list-style-type: none"> 1. Tester is signed in as Facilitator 2. Tester is on the Facilitator Add Challenge page
Steps	<ol style="list-style-type: none"> 1. Input "Challenge 1" into the "Challenge Name" input box 2. Input "2" into the "Number of Checkpoints" input box 3. Click on "Upload Image" button 4. Select "challenge1.png" when prompted 5. Click on "Submit" button 6. Observe screen
Expected Result	 <p>After closing success message</p> 
Actual Result	
Pass/Fail	

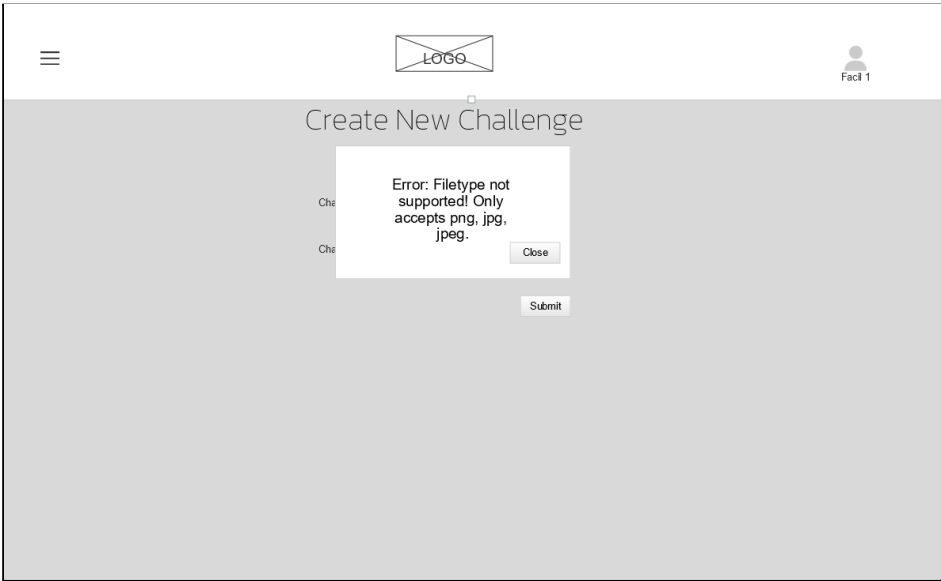
1.2.3 Duplicate Challenge Name When Adding Challenge

System Test Identifier	ST3
Relevant Use Case ID	UC13
System Test Name	Duplicate Challenge Name When Adding Challenge
Preconditions	<ol style="list-style-type: none"> 1. Tester is signed in as Facilitator 2. Tester is on the Facilitator Add Challenge page 3. Tester completed ST2 successfully
Steps	<ol style="list-style-type: none"> 1. Input "Challenge 1" into the "Challenge Name" input box 2. Input "2" into the "Number of Checkpoints" input box 3. Click on "Upload Image" button 4. Select "challenge2.png" when prompted 5. Click on "Submit" button 6. Observe screen
Expected Result	
Actual Result	
Pass/Fail	

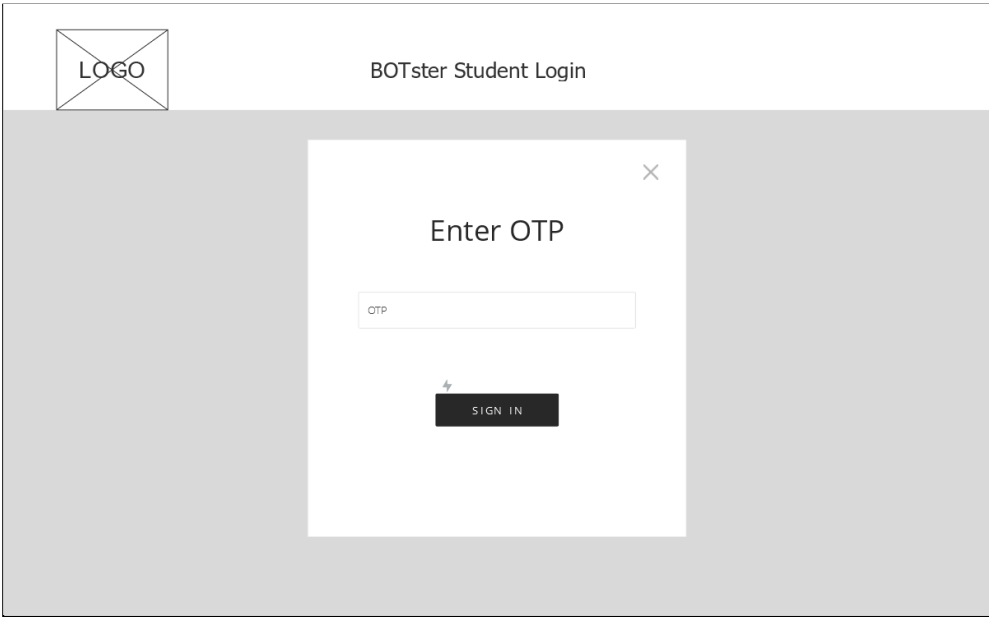
1.2.4 Invalid Checkpoint Value When Adding Challenge

System Test Identifier	ST4
Relevant Use Case ID	UC13
System Test Name	Invalid Checkpoint Value When Adding Challenge
Preconditions	<ol style="list-style-type: none"> 1. Tester is signed in as Facilitator 2. Tester is on the Facilitator Add Challenge page
Steps	<ol style="list-style-type: none"> 1. Input "Challenge 2" into the "Challenge Name" input box 2. Input "a" into the "Number of Checkpoints" input box 3. Click on "Upload Image" button 4. Select "challenge2.png" when prompted 5. Click on "Submit" button 6. Observe screen
Expected Result	 <p>The screenshot shows a web application interface for creating a new challenge. At the top, there is a navigation bar with a menu icon, a logo, and a user profile icon labeled 'Fac1'. Below the navigation bar, the main heading is 'Create New Challenge'. In the center, there is a modal dialog box with the text 'Error: Invalid Checkpoint Number!' and a 'Close' button. Below the modal, there is a 'Submit' button. The background of the page is a light gray color.</p>
Actual Result	
Pass/Fail	

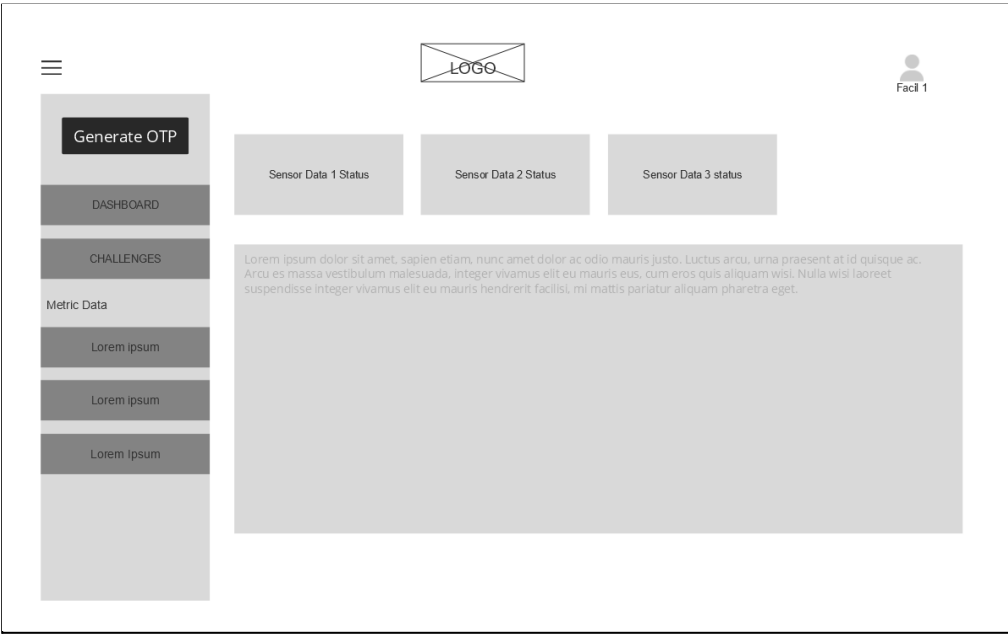
1.2.5 Invalid File Uploaded When Adding Challenge

System Test Identifier	ST5
Relevant Use Case ID	UC13
System Test Name	Invalid File Uploaded When Adding Challenge
Preconditions	<ol style="list-style-type: none"> 1. Tester is signed in as Facilitator 2. Tester is on the Facilitator Add Challenge page
Steps	<ol style="list-style-type: none"> 1. Input "Challenge 2" into the "Challenge Name" input box 2. Input "2" into the "Number of Checkpoints" input box 3. Click on "Upload Image" button 4. Select "challenge2.txt" when prompted 5. Click on "Submit" button 6. Observe screen
Expected Result	
Actual Result	
Pass/Fail	

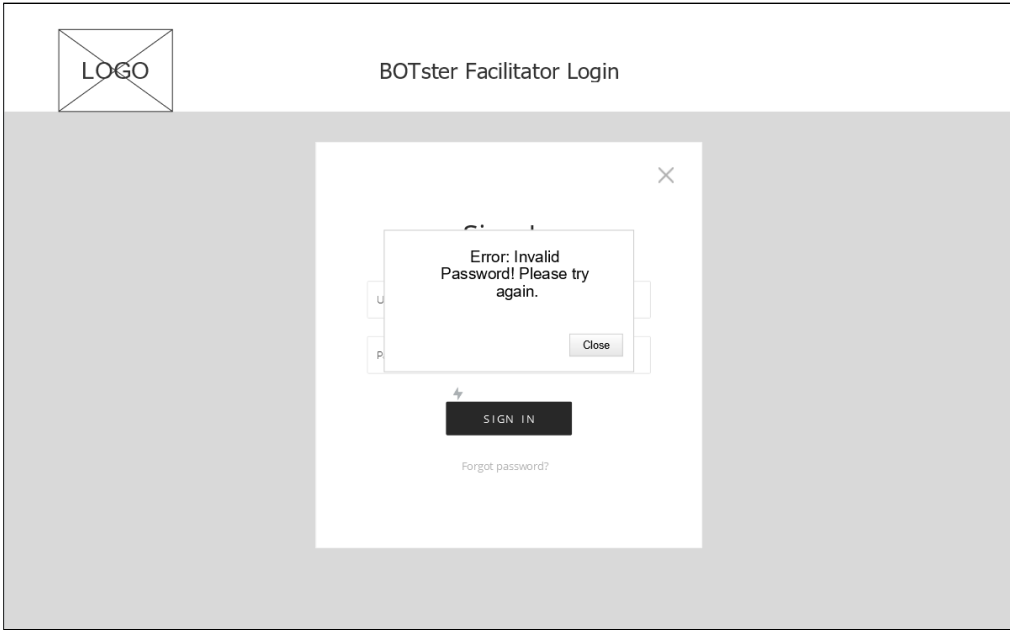
1.2.6 Open BOTster

System Test Identifier	ST6
Relevant Use Case ID	-
System Test Name	Open BOTster
Preconditions	<ol style="list-style-type: none"> 1. Web browser is running in foreground 2. BOTster web application is running 3. Tester's computer is connected to the same network as BOTster web application 4. Tester is not logged in
Steps	<ol style="list-style-type: none"> 1. Type "http://192.168.1.10" into the web browser's URL bar 2. Press the enter key on the keyboard 3. Observe screen
Expected Result	
Actual Result	
Pass/Fail	


1.2.7 Login as Facilitator

System Test Identifier	ST7
Relevant Use Case ID	UC8
System Test Name	Login as Facilitator
Preconditions	<ol style="list-style-type: none"> 1. Web browser is open 2. Tester is not logged in 3. Tester is on BOTster Login page
Steps	<ol style="list-style-type: none"> 1. Select "Facilitator" for the "Login as" dropdown input 2. Enter "P@ssw0rd" into the "Password" input field 3. Press the "Login" button 4. Observe screen
Expected Result	
Actual Result	
Pass/Fail	

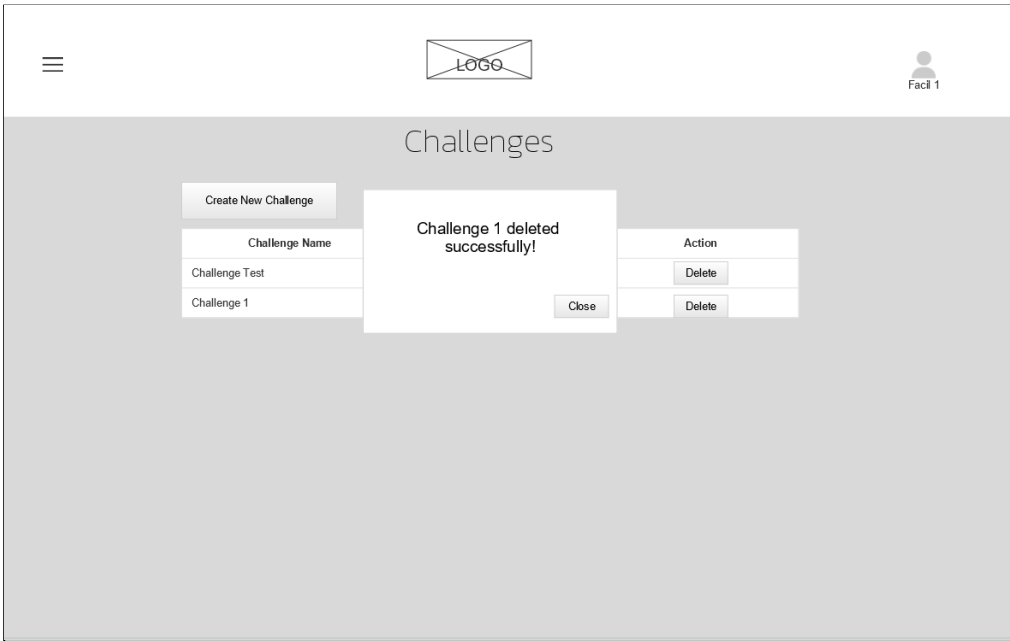
1.2.8 Facilitator Login using Invalid Password

System Test Identifier	ST8
Relevant Use Case ID	UC8
System Test Name	Facilitator Login using Invalid Password
Preconditions	<ol style="list-style-type: none"> 1. Web browser is open 2. Tester is not logged in 3. Tester is on BOTster Login page
Steps	<ol style="list-style-type: none"> 1. Select "Facilitator" for the "Login as" dropdown input 2. Enter "invalid" into the "Password" input field 3. Press the "Login" button 4. Observe screen
Expected Result	 <p>The screenshot shows the BOTster Facilitator Login interface. At the top left is a placeholder for a logo labeled 'LOGO'. The title 'BOTster Facilitator Login' is centered at the top. Below the title is a large grey rectangular area representing the login form. Overlaid on this form is a white error message box with a close button (X) in the top right corner. The error message reads: 'Error: Invalid Password! Please try again.' Below the error box, the 'SIGN IN' button is visible, along with a 'Forgot password?' link.</p>
Actual Result	
Pass/Fail	

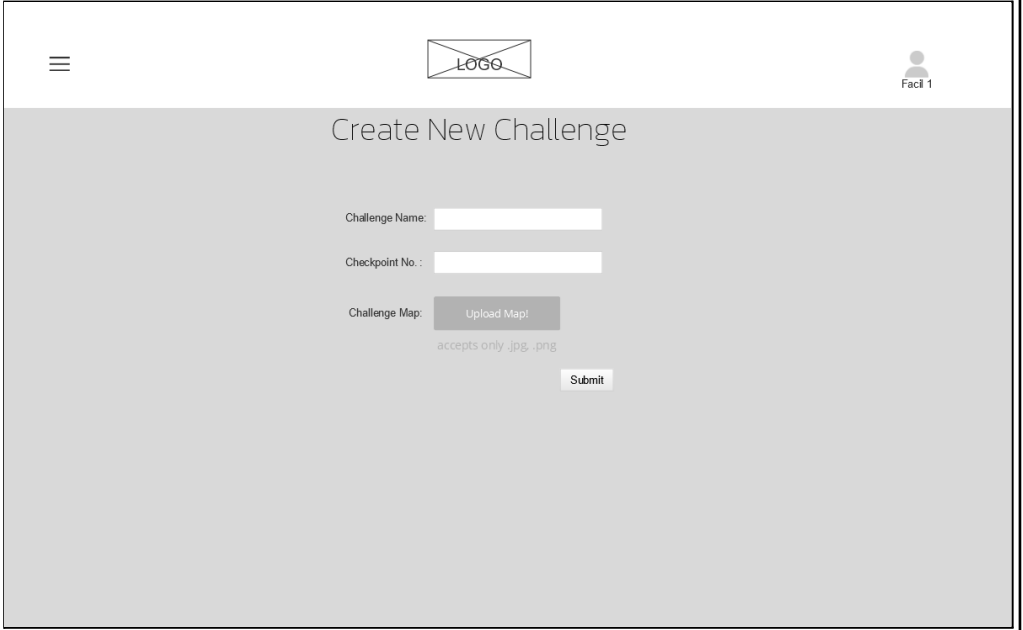
1.2.9 View Challenges List as Facilitator

System Test Identifier	ST9
Relevant Use Case ID	UC12
System Test Name	View Challenge List as Facilitator
Preconditions	<ol style="list-style-type: none"> 1. Tester is logged as Facilitator 2. Tester is on the Facilitator Dashboard page
Steps	<ol style="list-style-type: none"> 1. Click on "All Challenges" 2. Observe screen
Expected Result	
Actual Result	
Pass/Fail	

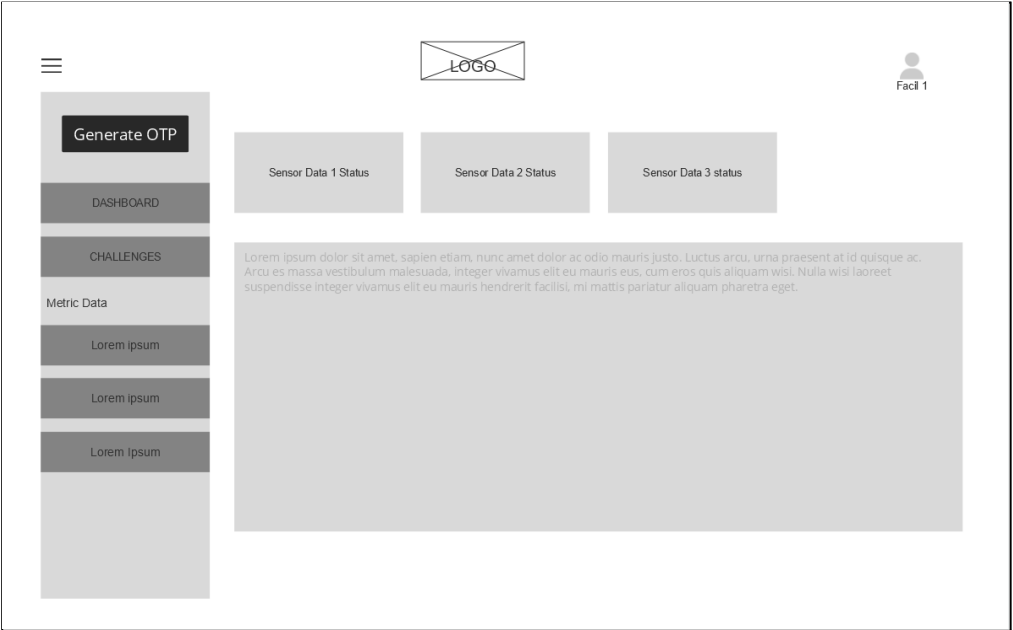
1.2.10 Delete Existing Challenge

System Test Identifier	ST10
Relevant Use Case ID	UC14
System Test Name	View Challenge List as Facilitator
Preconditions	<ol style="list-style-type: none"> 1. Tester is logged as Facilitator 2. Tester is on the Facilitator All Challenges page
Steps	<ol style="list-style-type: none"> 1. Click on the “Delete” button beside “Challenge 1” 2. Observe screen
Expected Result	 <p>The screenshot shows a web interface for 'Challenges'. At the top, there is a 'LOGO' placeholder and a user profile icon labeled 'Fac1 1'. Below the header, the title 'Challenges' is centered. On the left, there is a 'Create New Challenge' button and a table with columns 'Challenge Name' and 'Challenge Test'. The table contains one row: 'Challenge 1'. On the right, there is an 'Action' column with a 'Delete' button. A modal dialog box is displayed in the center, stating 'Challenge 1 deleted successfully!' with a 'Close' button.</p>
Actual Result	
Pass/Fail	

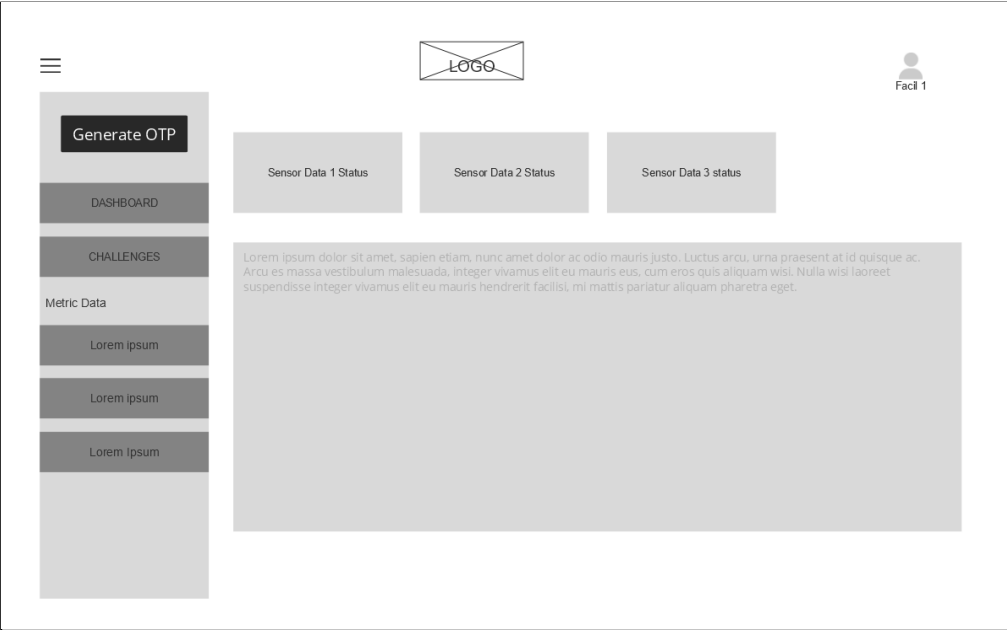
1.2.11 Display Add Challenge Page

System Test Identifier	ST11
Relevant Use Case ID	-
System Test Name	Display Add Challenge Page
Preconditions	<ol style="list-style-type: none"> 1. Tester is logged as Facilitator 2. Tester is on the Facilitator All Challenges page
Steps	<ol style="list-style-type: none"> 1. Click on the "Add Challenge" button 2. Observe screen
Expected Result	
Actual Result	
Pass/Fail	

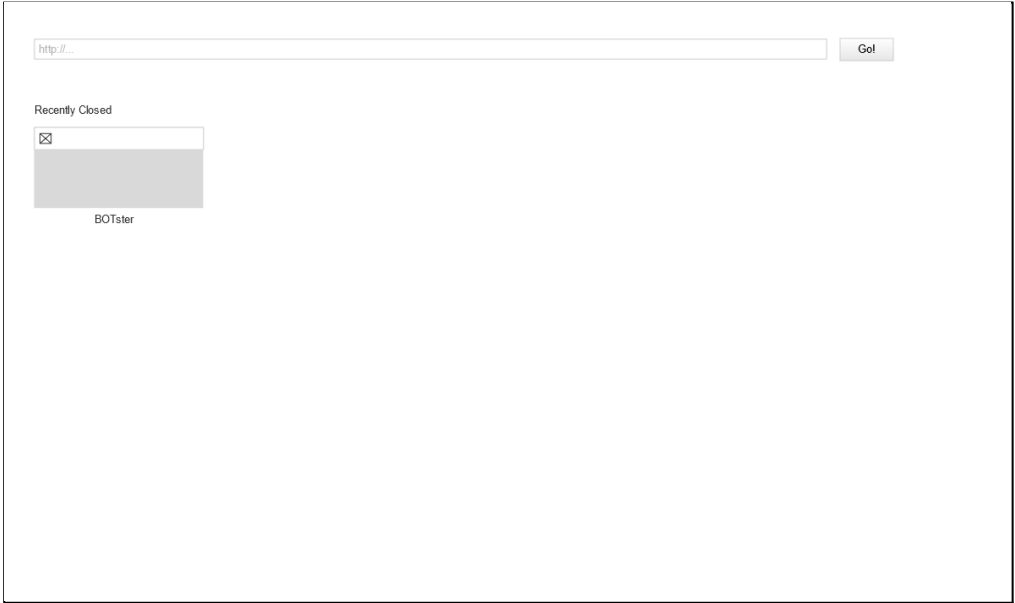
1.2.12 Back to Facilitator Dashboard from Facilitator Challenge Listing

System Test Identifier	ST12
Relevant Use Case ID	-
System Test Name	Back to Facilitator Dashboard from Facilitator Challenge Listing
Preconditions	<ol style="list-style-type: none"> 1. Tester is logged as Facilitator 2. Tester is on the Facilitator All Challenges page
Steps	<ol style="list-style-type: none"> 1. Click on the “Dashboard” link 2. Observe screen
Expected Result	
Actual Result	
Pass/Fail	


1.2.13 Closing Generated One-Time Password Modal

System Test Identifier	ST13
Relevant Use Case ID	-
System Test Name	Closing Generated One-Time Password Modal
Preconditions	<ol style="list-style-type: none"> 1. Tester is logged as Facilitator 2. Tester completed ST1 successfully
Steps	<ol style="list-style-type: none"> 3. Click on the “Close” button 4. Observe screen
Expected Result	
Actual Result	
Pass/Fail	

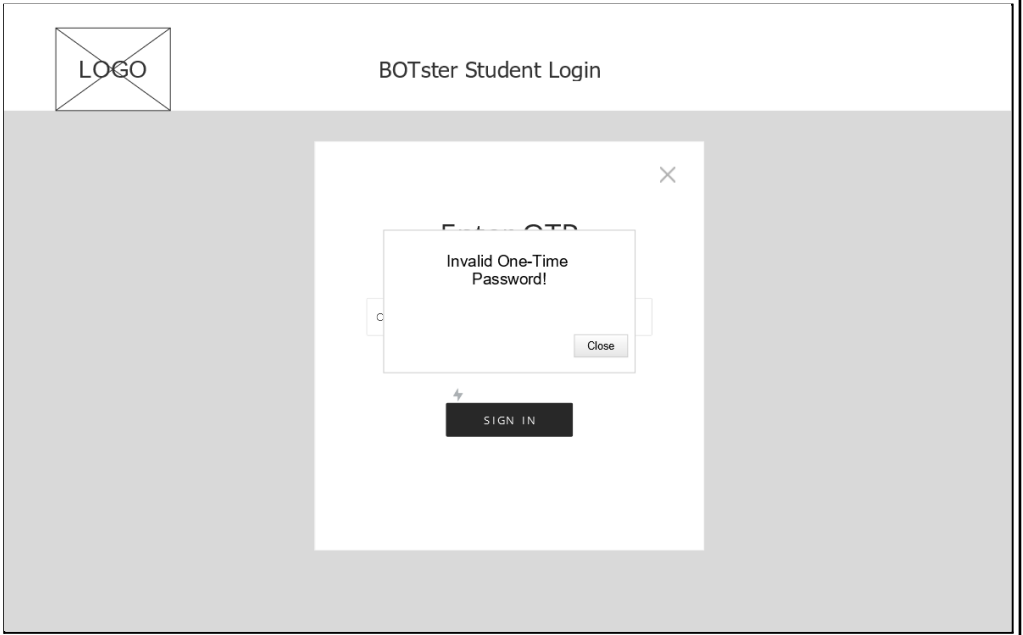
1.2.14 Closing BOTster from Facilitator Dashboard

System Test Identifier	ST14
Relevant Use Case ID	-
System Test Name	Closing BOTster from Facilitator Dashboard
Preconditions	3. Tester is logged as Facilitator 4. Tester is on the Facilitator Dashboard
Steps	5. Click on the "X" button on the tab that has BOTster web application opened 6. Observe screen
Expected Result	 <p>The screenshot shows a web browser window. At the top, there is a search bar with the text 'http://...' and a 'Go!' button. Below the search bar, there is a section titled 'Recently Closed'. Under this section, there is a single entry for a tab that has been closed. The tab is represented by a small icon with an 'X' and a grey rectangular area. Below the grey area, the text 'BOTster' is visible.</p>
Actual Result	
Pass/Fail	

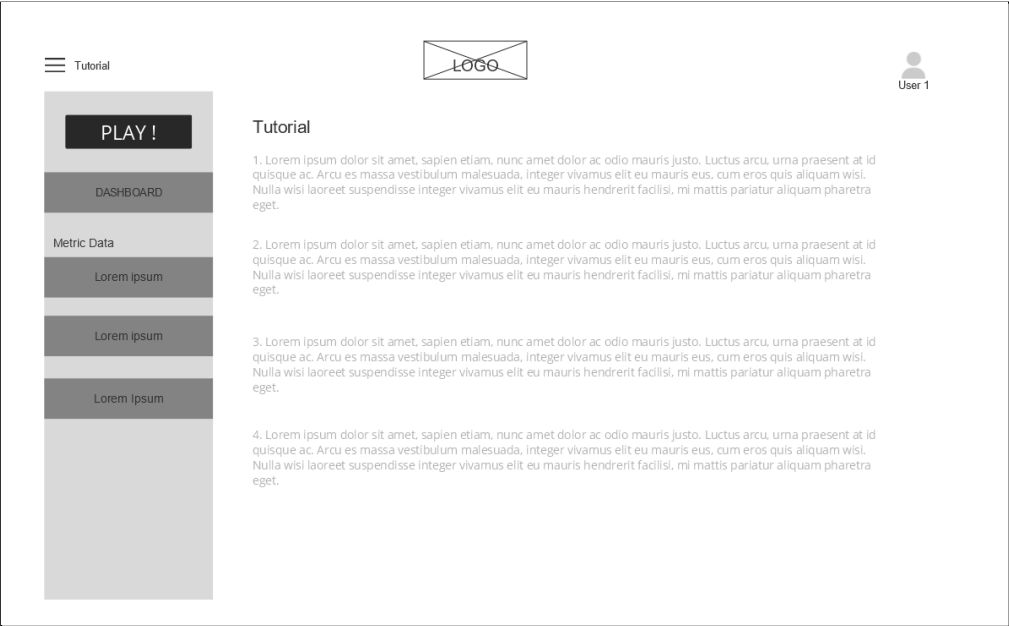
1.2.15 Login as Student

System Test Identifier	ST15
Relevant Use Case ID	UC1
System Test Name	Login as Student
Preconditions	<ol style="list-style-type: none"> 1. Web browser is open 2. Tester is not logged in 3. Tester is on BOTster Login page 4. Generated One-Time Password from ST1 is 123456
Steps	<ol style="list-style-type: none"> 1. Select "Student" for the "Login as" dropdown input 2. Enter "123456" into the "One-Time Password" input field 3. Press the "Login" button 4. Observe screen
Expected Result	
Actual Result	
Pass/Fail	

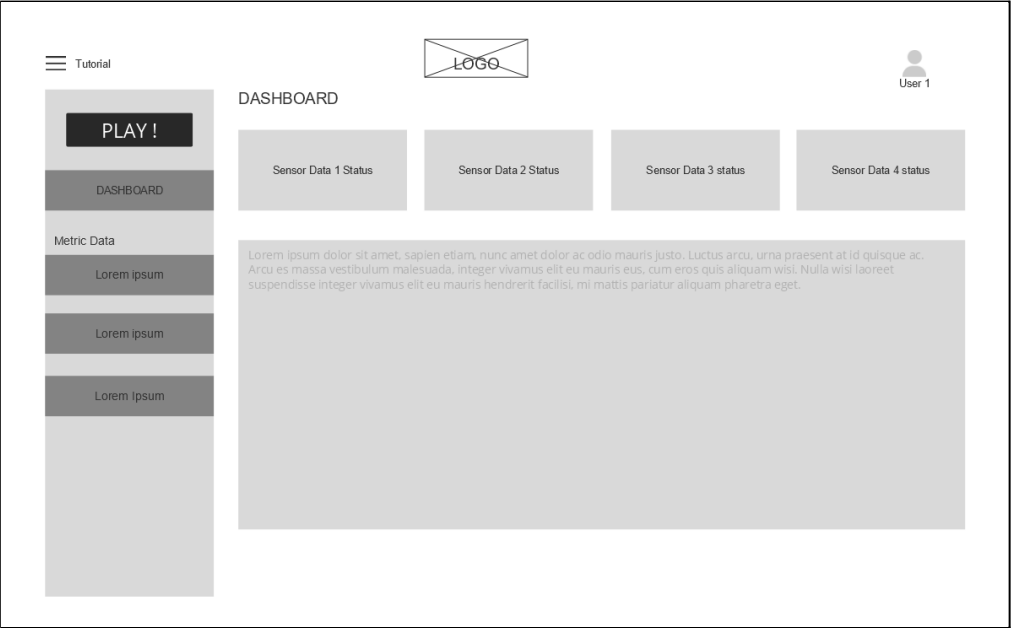
1.2.16 Login using Invalid One-Time Password

System Test Identifier	ST16
Relevant Use Case ID	UC1
System Test Name	Login using Invalid One-Time Password
Preconditions	<ol style="list-style-type: none"> 1. Web browser is open 2. Tester is not logged in 3. Tester is on BOTster Login page 4. Generated One-Time Password from ST1 is 123456
Steps	<ol style="list-style-type: none"> 1. Select "Student" for the "Login as" dropdown input 2. Enter "000000" into the "One-Time Password" input field 3. Press the "Login" button 4. Observe screen
Expected Result	 <p>The screenshot shows the 'BOTster Student Login' page. At the top left is a 'LOGO' placeholder. The main content area is a light gray rectangle. Inside it is a white modal box with a close button (X) in the top right corner. The modal box contains the text 'Invalid One-Time Password!' and a 'Close' button. Below the modal box is a dark gray 'SIGN IN' button with a lightning bolt icon to its left.</p>
Actual Result	
Pass/Fail	

1.2.17 Access Tutorial

System Test Identifier	ST17
Relevant Use Case ID	UC3
System Test Name	Access Tutorial
Preconditions	<ol style="list-style-type: none"> 1. Tester is logged as Student 2. Tester is on the Student Dashboard page
Steps	<ol style="list-style-type: none"> 1. Click on “Tutorial” 2. Observe screen
Expected Result	
Actual Result	
Pass/Fail	

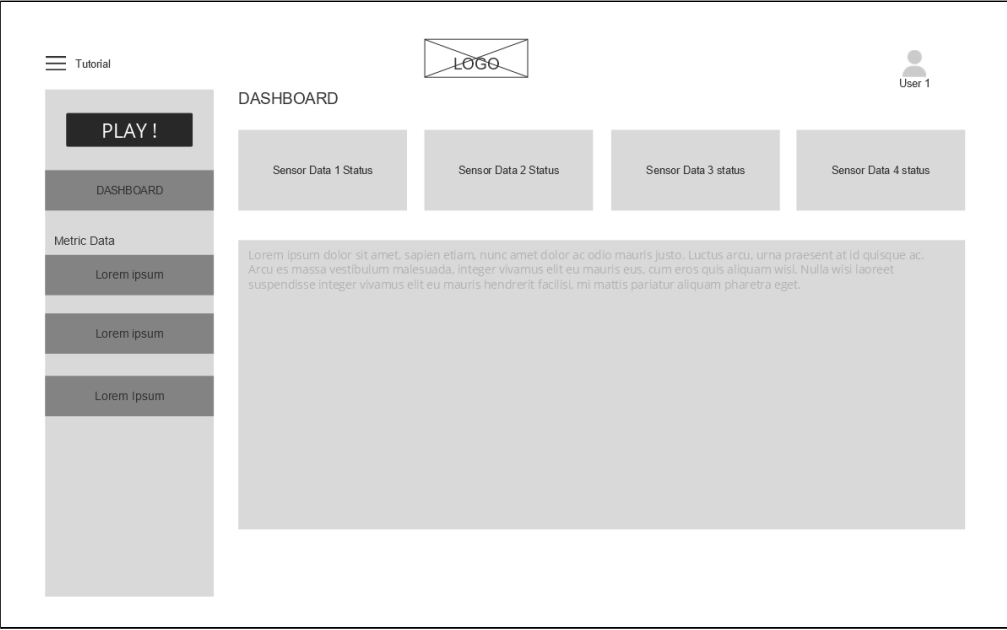
1.2.18 Back to Dashboard from Tutorial

System Test Identifier	ST18
Relevant Use Case ID	UC3
System Test Name	Back to Dashboard from Tutorial
Preconditions	<ol style="list-style-type: none"> 1. Tester is logged as Student 2. Tester is on the Tutorial page
Steps	<ol style="list-style-type: none"> 1. Click on the “Dashboard” link 2. Observe screen
Expected Result	
Actual Result	
Pass/Fail	

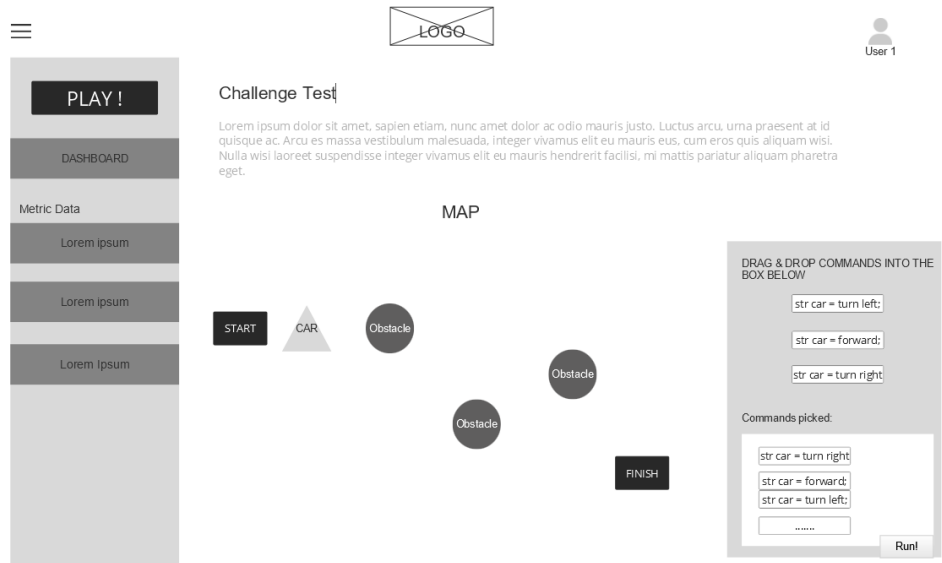
1.2.19 View Challenges List as Student

System Test Identifier	ST19									
Relevant Use Case ID	-									
System Test Name	View Challenge List as Student									
Preconditions	<div>1. Tester is logged as Student</div> <div>2. Tester is on the Student Dashboard page</div>									
Steps	<div>1. Click on “All Challenges”</div> <div>2. Observe screen</div>									
Expected Result	<div><div><div><div>Tutorial</div><div>PLAY !</div><div>DASHBOARD</div><div>Metric Data</div><div> Lorem ipsum</div><div> Lorem ipsum</div><div> Lorem ipsum</div></div><div><div>LOGO</div><div>User 1</div><div>LET'S PLAY !</div><div>Select a Challenge</div><div><table><thead><tr><th>Challenge Name</th><th>Challenge Map</th><th>Action</th></tr></thead><tbody><tr><td>Challenge XX</td><td>...</td><td>PLAY!</td></tr><tr><td>Challenge Test</td><td>...</td><td>PLAY!</td></tr></tbody></table></div></div></div></div>	Challenge Name	Challenge Map	Action	Challenge XX	...	PLAY!	Challenge Test	...	PLAY!
Challenge Name	Challenge Map	Action								
Challenge XX	...	PLAY!								
Challenge Test	...	PLAY!								
Actual Result										
Pass/Fail										

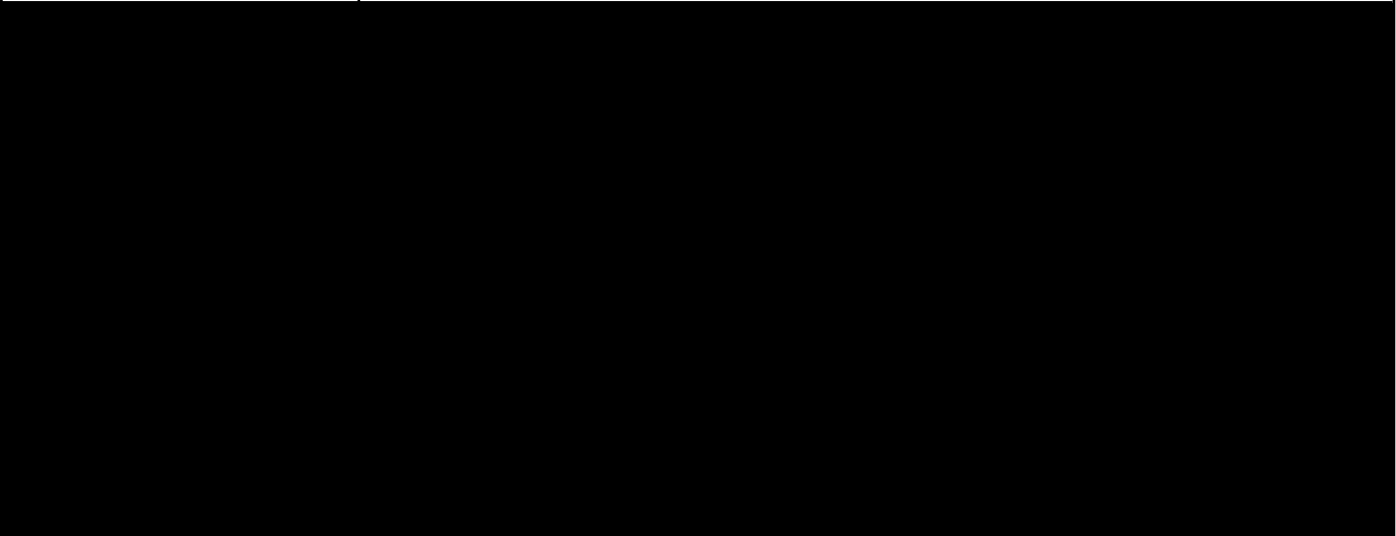
1.2.20 Back to Dashboard from Student Challenges List

System Test Identifier	ST20
Relevant Use Case ID	-
System Test Name	Back to Dashboard from Student Challenges List
Preconditions	<ol style="list-style-type: none"> 1. Tester is logged as Student 2. Tester is on the Student Challenge List page
Steps	<ol style="list-style-type: none"> 1. Click on the “Dashboard” link 2. Observe screen
Expected Result	
Actual Result	
Pass/Fail	

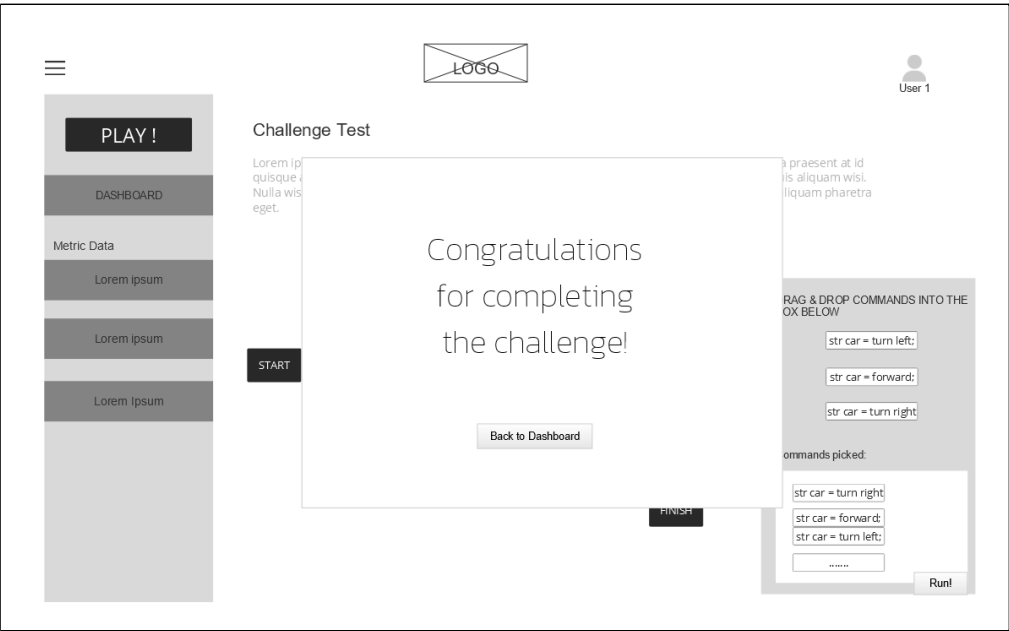
1.2.21 Start Challenge

System Test Identifier	ST21
Relevant Use Case ID	UC4
System Test Name	Start Challenge
Preconditions	<ol style="list-style-type: none"> 1. Tester is logged as Student 2. Tester is on the Student Challenge List page
Steps	<ol style="list-style-type: none"> 1. Click on the “Start” button beside “Challenge Test” 2. Observe screen
Expected Result	 <p>The screenshot displays the 'Challenge Test' interface. On the left is a sidebar with a 'PLAY!' button and a 'DASHBOARD' section containing 'Metric Data' and three 'Lorem ipsum' blocks. The main content area is titled 'Challenge Test' and includes a 'MAP' section. The map shows a 'START' button, a 'CAR' icon, and several 'Obstacle' icons. A 'FINISH' button is located at the bottom right of the map area. To the right of the map is a 'COMMANDS' panel with a 'DRAG & DROP COMMANDS INTO THE BOX BELOW' instruction. It lists three commands: 'str car = turn left:', 'str car = forward:', and 'str car = turn right:'. Below this is a 'Commands picked:' section with the same three commands and a 'Run!' button.</p>
Actual Result	
Pass/Fail	

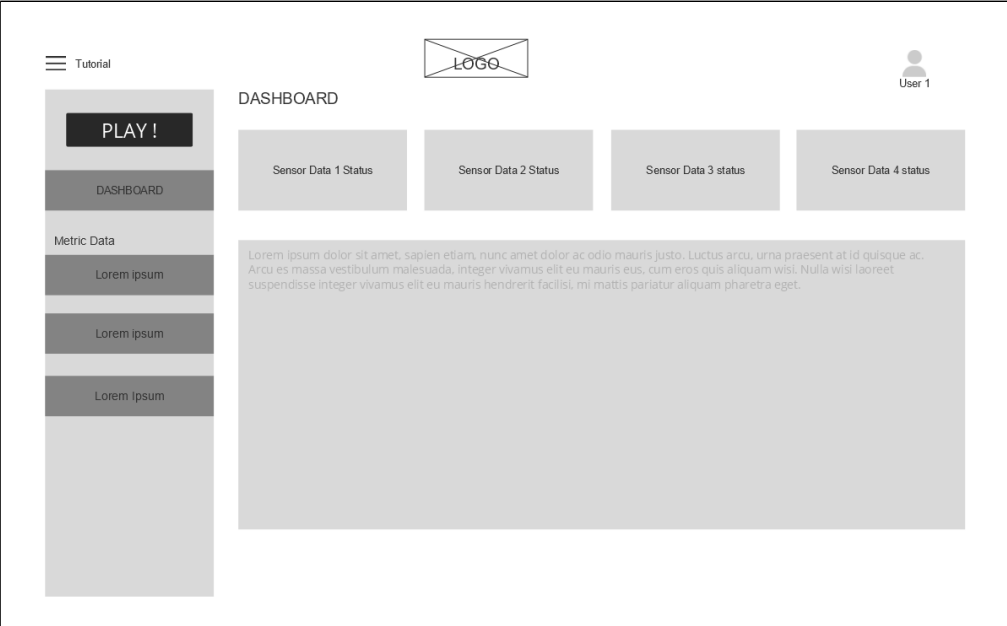
1.2.22 ~~Lost Connection to Robotic Car on Challenge Game Screen~~ (REMOVED)

System Test Identifier	ST22
	

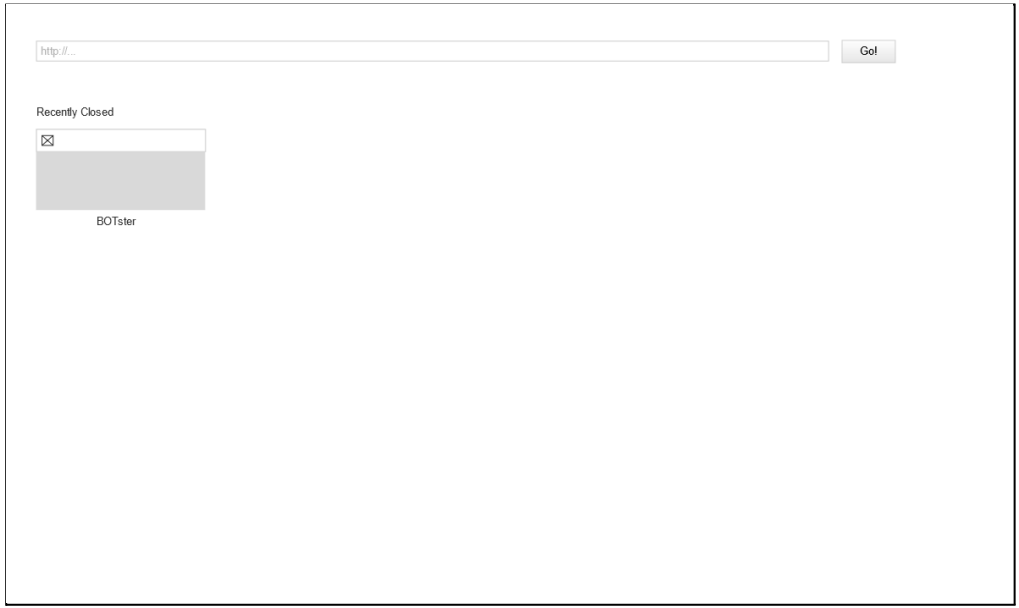
1.2.23 Complete Challenge

System Test Identifier	ST23
Relevant Use Case ID	-
System Test Name	Complete Challenge
Preconditions	<ol style="list-style-type: none"> 1. Tester is logged as Student 2. Tester completed ST21 successfully
Steps	<ol style="list-style-type: none"> 1. Drag and drop the "Move Forward" command block onto the Command panel 2 times 2. Press the "Issue Command" button 3. Observe screen
Expected Result	
Actual Result	
Pass/Fail	

1.2.24 Back to Dashboard after Challenge Completion

System Test Identifier	ST24
Relevant Use Case ID	-
System Test Name	Back to Dashboard after Challenge Completion
Preconditions	<ol style="list-style-type: none"> 1. Tester is logged as Student 2. Tester completed ST23 successfully
Steps	<ol style="list-style-type: none"> 1. Press the “Back to Dashboard” button 2. Observe screen
Expected Result	
Actual Result	
Pass/Fail	

1.2.25 Closing BOTster after Student Challenge Completion

System Test Identifier	ST25
Relevant Use Case ID	-
System Test Name	Closing BOTster after Student Challenge Completion
Preconditions	<ol style="list-style-type: none"> 1. Tester is logged as Facilitator 2. Tester completed ST23 successfully
Steps	<ol style="list-style-type: none"> 1. Click on the "X" button on the tab that has BOTster web application opened 2. Observe screen
Expected Result	 <p>The screenshot shows a web browser window. At the top, there is a search bar with the text 'http://...' and a 'Go!' button. Below the search bar, there is a 'Recently Closed' section. It contains a small window with a checked checkbox and a 'Go!' button. Below this window, the text 'BOTster' is visible.</p>
Actual Result	
Pass/Fail	