

# Software Requirements Specification

Version 1.0

<<Distributed Theatre Sound System>>

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## ***1.0. Introduction***

### ***1.1. Purpose***

The purpose of this SRS document is to present a detailed description of the Distributed Theatre Sound System. It will explain the purpose and features of the system, the various interfaces of the system, what the system will do, and the constraints under which the system must operate. This document is intended for the use of the development team and the client throughout the life of the project. While it is intended that this be a static document, it is also understood that changes to the original specifications may be necessary, and if changes are made, this document will be updated to match the updated specifications.

### ***1.2. Scope of Project***

This software system will be a Distributed Theatre Sound System for a local software development client. This system will be designed to create and execute theatre playlists. These playlists will be a collection of audio files used during a theatre production. The hardware for the system will include a dynamically acquired, wireless network of Raspberry Pi's. Utilizing the system, the user will be able to provide multiple audio sounds and effects in various locations of a theatre stage to affect all necessary sound events for a theatre performance.

### ***1.3. Glossary***

<b>Term</b>	<b>Definition</b>
Administrator	A user with elevated privileges. Presumably set as a safeguard to keep normal users from accidentally miss-configuring a function of the Distributed Theatre Sound System.
Cue	A sound file.
Node	A Raspberry Pi running the Distributed Theatre Sound System software.

Production	A playlist of cues that is associated with a theatre performance.
Software Requirements Specification	A document intended to describe a software in its entirety prior to production. This document is a Software Requirements Specification, Abbreviated: SRS
User	The person initiated and operating the Distributed Theatre Sound system.

### ***1.4. Overview of Document***

The next chapter of this document, the Overall Description section, provides an broad description of the functionality of the system. It describes the informal requirements and is used to establish a context for the technical requirements specification in the next chapter.

The final chapter, Requirements Specification section, of this document is written primarily for the developers and describes in technical terms the details of the functionality of the product.

Both sections of the document describe the same software product in its entirety, but are intended for different audiences and thus use different language.

## **2. The Overall Description**

### ***2.1 System Environment***

#### **2.1.1 Hardware**

Wireless media solution that runs on raspberry pi nodes

#### **2.1.2 Software**

Web app that allows users to interact with the software

### ***2.2 Product Functions***

#### ***Login Page***

##### ***Login Page Use Case***

###### **Brief Description**

Interface to allow user to enter login credentials for access to the Distributed Theatre Sound System.

###### **Initial Step-By-Step Description**

Before this use case can be initiated, the user must have a computer connected to the local network of the Distributed Theatre Sound System.

1. The user accesses a Node by entering the IP of the Node into a connected computers Internet Browser
2. The user enters the username and password to gain access.

**Xref:** Section 3.2.1, Load Production

#### ***Cue Controller Page***

##### ***Load Production Use Case***

###### **Brief Description**

An interface that allows users to control the sound set of a chosen production.

###### **Initial Step-By-Step Description**

Before this use case can be initiated, a production must be created in the Production Configuration Interface.

3. The User chooses to search by production name.

4. The system loads the chosen production.
5. If no production exists, they are redirected to the Production Configuration Interface.

**Xref:** Section 3.2.2, Load Production

### ***Production Cue List Use Case***

#### **Brief Description**

This section is a list of all cues assigned to the selected production.

#### **Initial Step-By-Step Description**

Before this use case can be initiated, a production must be loaded.

1. System displays all cues associated with the loaded production in chronological order.
2. The user can play any cue in the list by double clicking it or start the next highlighted cue by clicking the “next” button.
3. If necessary, the list will be scrollable.

**Xref:** Section 3.2.3, Production Cue

### ***Active Cue List Use Case***

#### **Brief Description**

This section is a list of all cues currently playing.

#### **Initial Step-By-Step Description**

Before this use case can be initiated, at least one cue must be in play.

1. System displays any currently running cues.
2. The user can resume/pause or cancel each cue.
3. The user can resume/pause or cancel all active cues.
4. As a cue ends, the system removes it from the list

**Xref:** Section 3.2.4, Active Cue List

## ***Network Configuration Page***

### ***Manage/Configure Node Use Case***

#### **Brief Description**

An interface to configure/manage nodes and network options for the nodes.

**Initial Step-By-Step Description**

Before this use case can be initiated, nodes are turned on and connected to the network.

1. System displays a list of active/inactive nodes discovered.
2. System displays which node the user is currently logged into.
3. The user can change the hostname of any node.
4. The user can forget nodes.
5. The user can send an audio test cue to locate/test each node.
6. The system will display a list of computers that can access the web app without a password.
7. The user can click a button to add the currently logged on computer to the list of acceptable computers.

**Xref:** Section 3.2.5, Manage/Configure Node

## ***Production Configuration Page***

### ***Import Sound File Use Case***

**Brief Description**

An interface to import .wav/.mp3 files for use in productions.

**Initial Step-By-Step Description**

1. User clicks import sound file.
2. System allows the user to browse and select a .wav or .mp3 file or multiple files at once.
3. The selected file is saved into a created sound file folder.

**Xref:** Section 3.2.6, Import Sound File

### ***Open/Create/Delete Production Use Case***

**Brief Description**

A menu option that allows the user to create or make changes to a production.

**Initial Step-By-Step Description**

1. User chooses to create a production from the file menu.
  - 1.1. User enters a name for the production.
  - 1.2. Option to set a password to edit or delete the production.
  - 1.3. The system creates the production interface for editing.
2. User chooses to open an existing production from the file menu.
  - 2.1. The user enters a password if required.
  - 2.2. The system opens the production interface for editing.

3. The user chooses to delete an existing production from the file menu.
  - 3.1. The user enters a password if required.
  - 3.2. The system deletes the production.

**Xref:** Section 3.2.7, Open/Create/Delete Production

## ***Configure Production Use Case***

### **Brief Description**

An interface that allows a user to add and remove sound cues, configure sound effects, and assign nodes.

### **Initial Step-By-Step Description**

1. User can add a sound cue to the production.
  - 1.1. User chooses a sound for the cue.
  - 1.2. User can add effects to the cue.
  - 1.3. User can add nodes to the cue.
2. User can delete a sound cue from the production.
3. User can edit a sound cue from the production.
  - 3.1. User can change the sound for the cue.
  - 3.2. User can change/remove/add effects for the cue.
  - 3.3. User can remove/add nodes for the cue.
4. User can reorder sound cues by clicking a reorder button that populates up and down arrows next to the cues.
  - 4.1. When the user is done they can click save to disable the ability to change the order of the cues.
5. User can click the save button to save a production and sync it with all other nodes.

**Xref:** Section 3.2.8, Configure Production

## ***2.3 User Characteristics***

The User is expected have their own sound files in .wav or .mp3 format and to know where they have stored them on their computer. The user needs to know how to open a browser and to put the Hostname in to log into the web app on the Raspberry Pi.

The person who sets the system of Raspberry Pi's should at least have a general knowledge of setting up a local network. They also need to be able to load the Distributed Theatre Sound System web app software onto the Raspberry Pi(s),



which will have a Linux OS on them. They also need to set, or know, the hostname on at least one of the Raspberry Pi's.

## ***2.4 Constraints, Assumptions and Dependencies***

Each Raspberry Pi will have a compatible Linux based OS installed. Raspberry Pi's will be on a LAN and able to discover each other over the network. The Distributed Theatre Sound System web app software will be loaded onto each Raspberry Pi.

### 3. Specific Requirements

#### 3.1 External Interfaces

The user needs a connection to the network and a working browser with valid credentials to log into the Distributed Theatre Sound System.

#### 3.2 Functions

##### *Login Page*

##### *3.2.1 Login Page*

<b>Use Case Name</b>	Login
<b>XRef</b>	Section 2.2.1, Login Section 2.2.2, Cue Controller
<b>Trigger</b>	The user accesses a Node by entering the IP of the Node into a connected computers Internet Browser.
<b>Precondition</b>	The user must have a computer connected to the local network of the Distributed Theatre Sound System.
<b>Basic Path and Functionality Specifications</b>	1. The user attempts to access a Node on the Distributed Theatre Sound System. 2. The system presents an option to login as administrator or user. 3. The user or administrator must enter credentials to login. 4. The system logs the user into the Node and is presented with the Cue Controller Page.
<b>Alternative Paths</b>	The computer was set to be remembered for future logins thus bypassing the login page.
<b>Postcondition</b>	If successful credentials are presented the user should be logged onto the Distributed Theatre Sound System and presented the Cue Controller Window.
<b>Exception Paths</b>	None.

## ***Cue Controller Page***

### ***3.2.2 Load Production***

<b>Use Case Name</b>	Load Production
<b>XRef</b>	Section 2.2.2, Load Production
<b>Trigger</b>	The user has presented valid credentials and has successfully been logged onto the Distributed Theatre Sound System.
<b>Precondition</b>	The user must have a computer connected to the local network of the Distributed Theatre Sound System and presented valid login credentials.
<b>Basic Path and Functionality Specifications</b>	<ol style="list-style-type: none"><li>1. User is directed to browse for an existing production.</li><li>2. System has locked the path to a specific directory that holds all the productions.</li><li>3. Once selected the system will load all the cues into the cue list and the first cue is highlighted.</li></ol>
<b>Alternative Paths</b>	<ol style="list-style-type: none"><li>1. If no productions exist the options to load are greyed out.</li><li>2. The user can cancel to return to the cue controller page.</li></ol>
<b>Postcondition</b>	Once a valid production is selected all the cues are loaded into the cue list and the first cue is highlighted. The production is ready to launch.
<b>Exception Paths</b>	If a user attempts to load a corrupted production the user is notified and the production isn't loaded.

### ***3.2.3 Production Cue List***

<b>Use Case Name</b>	Production Cue List
<b>XRef</b>	Section 2.2.3, Production Cue List
<b>Trigger</b>	The user has presented valid credentials and has successfully been logged onto the Distributed Theatre Sound System or a production has been loaded.

<b>Precondition</b>	The user has presented valid credentials and has successfully been logged onto the Distributed Theatre Sound System.
<b>Basic Path and Functionality Specifications</b>	<ol style="list-style-type: none"> <li>1. The cue list is populated with cues from the loaded production in chronological order.</li> <li>2. The first cue is highlighted by default.</li> <li>3. The user can choose to highlight a different cue by single clicking on it. This will not start the cue.</li> <li>4. The user can double click on any cue to start that cue. If this cue is already playing it will be stopped and started from the beginning.</li> <li>5. The user can click a “NEXT” button that will play the highlighted cue.</li> <li>6. Every time a cue is started, the next cue in the list will then be highlighted.</li> <li>7. If necessary, the list will be scrollable.</li> <li>8. There is a color scheme that will be used to identify the state of cues in the list. <ol style="list-style-type: none"> <li>8.1. Gray: Skipped or completed cues.</li> <li>8.2. Yellow: Currently playing cues.</li> <li>8.3. Green: Next (highlighted) cue.</li> <li>8.4. Black: Pending cues in the list.</li> </ol> </li> <li>9. The cue can be seen in minimized mode, and expanded mode. <ol style="list-style-type: none"> <li>9.1. In minimized mode the only things that are shown are the cue name and the time remaining, a plus sign to expand the options, a number depicting the chronological order, and a warning indicating if there are any issues with the cue.</li> <li>9.2. In expanded mode, everything that is in minimized mode is shown, except the plus sign is now a minus sign. In addition, all effects, assigned nodes, and the sound filename.</li> </ol> </li> <li>10. The warning indicator mentioned in section 9 would alert the user to any missing nodes, if no nodes are assigned, or missing sound file. When in expanded mode, the specific errors will be in red.</li> <li>11. There will be a global volume control from 0 to 110 percent.</li> </ol>
<b>Alternative Paths</b>	If no production has been loaded, this area is empty.
<b>Postcondition</b>	None.
<b>Exception Paths</b>	<ol style="list-style-type: none"> <li>1. Missing sound files: No sound will be played.</li> <li>2. Missing nodes: System sends play request to all connected nodes assigned to the cue.</li> <li>3. If there is a corrupted sound file played, no sound is</li> </ol>

	played and a warning is shown on the cue.
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### ***3.2.4 Active Cue List***

<b>Use Case Name</b>	Active Cue List
<b>XRef</b>	Section 2.2.4, Active Cue List
<b>Trigger</b>	The user has presented valid credentials and has successfully been logged onto the Distributed Theatre Sound System or a production has been loaded.
<b>Precondition</b>	The user has presented valid credentials and has successfully been logged onto the Distributed Theatre Sound System.
<b>Basic Path and Functionality Specifications</b>	<ol style="list-style-type: none"> <li>1. When a sound cue is active, it is displayed in the active cue list.</li> <li>2. If necessary, the list will be scrollable.</li> <li>3. Active cues can be paused or removed.</li> <li>4. The active cue has the name, pause/remove buttons, and the time remaining.</li> <li>5. There will be pause all and stop all buttons to pause and stop all active cues at the same time.</li> </ol>
<b>Alternative Paths</b>	<ol style="list-style-type: none"> <li>1. If an active cue has been paused, the option changes to resume.</li> <li>2. If the pause all button has been pushed, the option changes to a resume all.</li> </ol>
<b>Postcondition</b>	When a cue ends, it will be removed from the list.
<b>Exception Paths</b>	Nothing happens if the pause all or stop all buttons are pushed when the active list is empty.

## ***Network Configuration Page***

### ***3.2.5 Manage/Configure Node***

<b>Use Case Name</b>	Manage/Configure Node
<b>XRef</b>	Section 2.2.5, Manage/Configure Node
<b>Trigger</b>	The user has selected to load the Network Configuration page.

<b>Precondition</b>	The user has presented valid credentials and has successfully been logged onto the Distributed Theatre Sound System. Then the user has selected the Network Configuration page and provided an administrator password if logged in as a user.
<b>Basic Path and Functionality Specifications</b>	<ol style="list-style-type: none"> <li>1. When the page loads, a list of discovered nodes are displayed. <ol style="list-style-type: none"> <li>1.1. Online nodes will be indicated by the name highlighted in green.</li> <li>1.2. Offline nodes will be indicated by being greyed out.</li> </ol> </li> <li>2. The administrator can right click on any discovered node. <ol style="list-style-type: none"> <li>2.1. The administrator can select to “forget” a node.</li> <li>2.2. The administrator can select to rename a node.</li> <li>2.3. The administrator can select to locate a node.</li> <li>2.4. The administrator can select to remotely reboot a node.</li> </ol> </li> <li>3. The administrator can select an option from the drop down menu. <ol style="list-style-type: none"> <li>3.1. The administrator can select to “forget” a node.</li> <li>3.2. The administrator can select to rename a node.</li> <li>3.3. The administrator can select to locate a node.</li> <li>3.4. The administrator can select to remotely reboot a node.</li> </ol> </li> <li>4. The administrator can select a button to bring up a window that will show all the saved computers that can bypass the login page. <ol style="list-style-type: none"> <li>4.1. The administrator can select to add the currently logged on computer to the list of remembered computers.</li> <li>4.2. The administrator can select one of the computers in the list and select to remove it from the list.</li> </ol> </li> <li>5. The administrator can select to change passwords. <ol style="list-style-type: none"> <li>5.1. The administrator will be asked if he wants to change the admin password or guest password.</li> <li>5.2. The administrator will type in a new password and to confirm it and the password of the chosen type will be changed.</li> </ol> </li> </ol>
<b>Alternative Paths</b>	The user can cancel out of the saved computers window.
<b>Postcondition</b>	None.
<b>Exception Paths</b>	None.

## ***Production Configuration Page***

### ***3.2.6 Import Sound File***

<b>Use Case Name</b>	Import sound File
<b>XRef</b>	Section 2.2.6, Import Sound File
<b>Trigger</b>	The user has selected to load the Production Configuration page.
<b>Precondition</b>	The user has presented valid credentials and has successfully been logged onto the Distributed Theatre Sound System. Then the user has selected the Production Configuration page.
<b>Basic Path and Functionality Specifications</b>	<ol style="list-style-type: none"><li>1. The user clicks on the import sound file button.</li><li>2. The user browses to the directory on the local computer where the sound file is stored.</li><li>3. The user is locked down to only see .wav and .mp3 files.</li><li>4. The user selects a file and has the option to open or close.</li></ol>
<b>Alternative Paths</b>	The user can cancel to return to the Production Configuration Page.
<b>Postcondition</b>	The imported sound file is downloaded to the designated directory and synced with all connected nodes.
<b>Exception Paths</b>	None.

### ***3.2.7 Open/Create/Delete Production***

<b>Use Case Name</b>	Open/Create/Delete Production
<b>XRef</b>	Section 2.2.7, Open/Create/Delete Production
<b>Trigger</b>	The user has selected to load the Production Configuration page.
<b>Precondition</b>	The user has presented valid credentials and has successfully been logged onto the Distributed Theatre Sound System. Then the user has selected the Production Configuration page.
<b>Basic Path</b>	<ol style="list-style-type: none"><li>1. The user selects to open an existing production.</li></ol>

<b>and Functionality Specifications</b>	1.1. The user selects from a list of existing productions. 2. The user selects to create a new production. 2.1. The user is asked to enter a name and has the option to assign a password for this production. 3. The user selects to delete an existing production. 3.1. The user selects from a list of existing productions. 3.2. A warning pops up asking to confirm if they want to delete this production.
<b>Alternative Paths</b>	1. When opening a production that has a password associated with it, the user will be prompted for the password. 2. If no productions currently exist, the open and delete production options will be greyed out. 3. The user has the option to cancel when opening a production. 4. The user has the option to cancel when deleting a production. 5. The user has the option to cancel when creating a production. 6. If an invalid password is entered the user is notified and they can try to reenter the password again.
<b>Postcondition</b>	1. A production is loaded and ready for editing. 2. A production is created and ready for editing. 3. The production is deleted for all nodes.
<b>Exception Paths</b>	If a user attempts to load a corrupted production the user is notified and the production isn't loaded.

### ***3.2.8 Configure Production***

<b>Use Case Name</b>	Configure Production
<b>XRef</b>	Section 2.2.8, Configure Production
<b>Trigger</b>	The user has loaded a valid production.
<b>Precondition</b>	The user has presented valid credentials and has successfully been logged onto the Distributed Theatre Sound System. Then the user has selected the Production Configuration page.
<b>Basic Path and Functionality Specifications</b>	1. The user selects to create a cue. 1.1. The user is required to enter a name and add a sound. 1.1.1. To select a sound, the user will be provided a list of imported sounds.



	<p>1.2. The user can optionally assign nodes and add effects.</p> <p>1.2.1. To assign a node, the user will be provided a list of discovered nodes to choose from.</p> <p>1.2.2. When a node is assigned, the user will be able to add effects for that node.</p> <p>1.2.2.1. Fade in: If checked, the user enters the length (in milliseconds) of the fade in.</p> <p>1.2.2.2. Fade out: If checked, the user enters the length (in milliseconds) of the fade out.</p> <p>1.2.2.3. Volume: If checked, the user determines to increase or decrease the volume with a slider in relation to the global volume.</p> <p>1.2.2.4. Adjust Pitch: If checked, the user determines to increase or decrease the pitch with a slider.</p> <p>1.2.2.5. Delay: If checked, the user enters the length (in milliseconds) of the delay.</p> <p>1.2.3. The user can listen to the cue as it stands by pressing the test button.</p> <p>1.2.4. When the user is finished customizing effects, the user can save the node to the cue.</p> <p>1.3. Once the user is done customizing nodes, the user can save the cue and it is added to the end of the production.</p> <p>2. The user selects to delete a cue.</p> <p>2.1. The user selects to delete cues and checkboxes appear next to the cues. The user selects which cues to delete by selecting the checkbox.</p> <p>2.2. The user then selects a confirm button to delete all the checked cues.</p> <p>3. The user selects to edit an existing cue.</p> <p>3.1. The user can edit the effects of an assigned node.</p> <p>3.2. The user can add a node and assign effects to it. See 1.2.2. for details on editing effects.</p> <p>3.3. Once the user is done customizing nodes, the user can save the changes.</p> <p>4. The user selects to reorder the cues.</p> <p>4.1. Up and down arrows will appear next to each cue.</p> <p>4.2. When the user clicks an arrow, the cues will be moved up or down the list respectively.</p> <p>5. The user selects to save the production.</p> <p>6. If the user navigates away from the Production Configuration page or closes the browser prior to saving, the user is prompted to save the production.</p> <p>7. When opening a production that is currently being edited, an error message will be displayed and the user</p>
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	is given the option to force open the production by entering the program level password and the password to the production if required.
<b>Alternative Paths</b>	<ol style="list-style-type: none"> <li>1. When assigning a node to a cue, if at least one node has been assigned already, the user can copy the effects from an already assigned node or can customize effects.</li> <li>2. The user can cancel when customizing effects to a node.</li> <li>3. The user can cancel when adding a node to a cue.</li> <li>4. The user can cancel when adding a cue.</li> <li>5. The user can cancel when deleting a cue.</li> </ol>
<b>Postcondition</b>	The production is saved to all connected nodes.
<b>Exception Paths</b>	When a sound is tested and it is corrupted or missing, the user is notified and the sound is not played.

## *Miscellaneous*

### *3.2.9 Network Structure*

<b>Use Case Name</b>	Network Structure
<b>XRef</b>	None.
<b>Trigger</b>	The Raspberry Pi is booted up.
<b>Precondition</b>	None.
<b>Basic Path and Functionality Specifications</b>	<ol style="list-style-type: none"> <li>1. When the Raspberry Pi is booted up, a listener is started. <ol style="list-style-type: none"> <li>1.1. The listener listens for commands from other nodes.</li> </ol> </li> <li>2. Network discovery. <ol style="list-style-type: none"> <li>2.1. When a node comes online, the node sends out a “hello” and the listeners hear it.</li> <li>2.2. The discovered node will be placed in each nodes network configuration page, see 3.2.5.</li> </ol> </li> </ol>
<b>Alternative Paths</b>	None.
<b>Postcondition</b>	Listener is running.
<b>Exception Paths</b>	None.

### ***3.3 Performance Requirements***

3.3.1. The Raspberry Pi's need to be running a Linux distribution (Raspian, ArchARM, etc.) to function properly.

3.3.2. Since the software will be running on Raspberry Pi's the program cannot be intensely resource heavy.

3.3.3. We will tailor our software to fit the resources available on a Raspberry Pi, not tailor the computer to our software (has to work on Raspberry Pi's before any other medium).

### ***3.4 Logical Hard Disk Requirements***

3.4.1. The hard disk must have enough space to fit a flavor of Linux that works on the Raspberry Pi, our software, and any sounds that the user will want to import.

3.4.2. Both the operating system and our software will be static in the amount of memory they take up. There should be no variance amongst all the nodes when they are bare-bones.