# Overview

4D theater attractions are a staple of themed entertainment that typically consist of high-quality 3D projection, surround sound audio, lighting, and effects like water, bubbles, fans, scents, etc. The need for perfectly synchronized high-quality AV and special effects make Alcorn McBride products the right tool for the job. The AV Binloop Uncompressed offers stunning and smooth 3D 4K60 video playback with an easy workflow and zero maintenance, while the AV Binloop reinforces it with synchronized audio. With the V16X show controller and our ShowTouch panels at the heart of the system, you can control any DMX-based lighting fixtures or IO-based effects while providing operators with easy touch panel control, scheduling, and monitoring of the system.

4D Theater Application
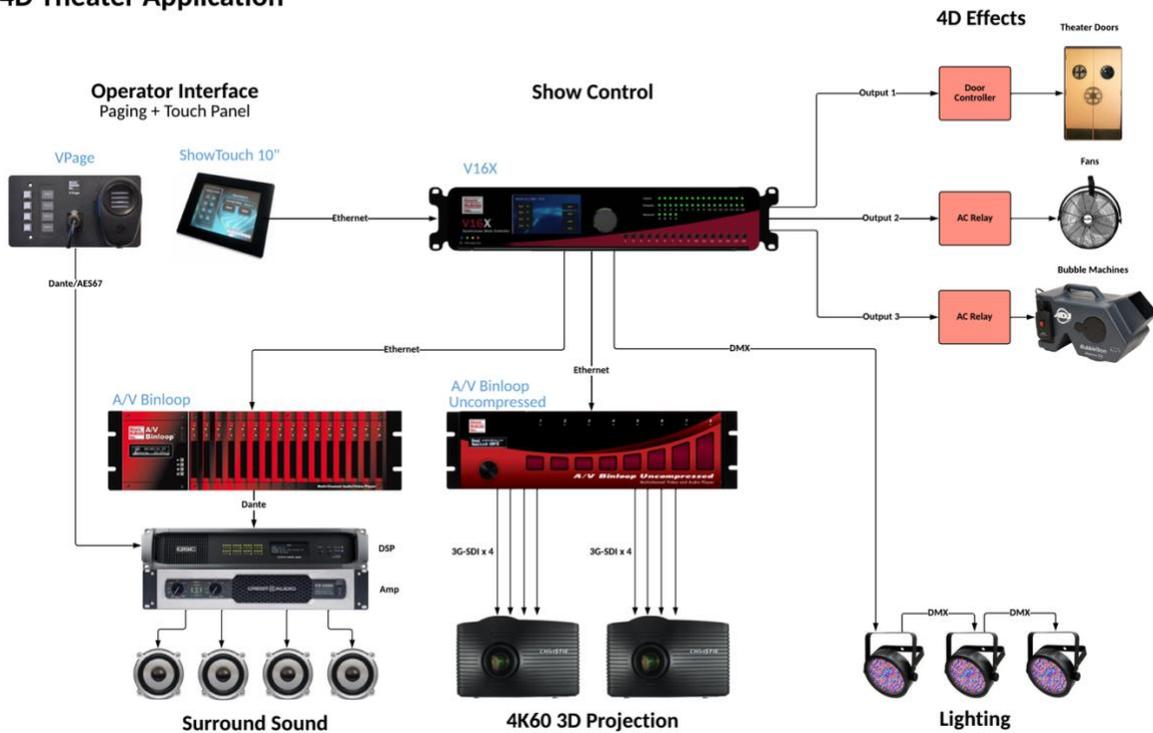
How It's Done

Introduction

A typical 4D theater show is based around high-quality 3D projection and surround sound. To make the experience more immersive for guests, precisely timed effects occur at given points during the show. For example, fans may kick on during a flying scene to make the guest feel like they are soaring through the air. Other common effects include things like compressed air blasts, water spritzes, scent machines, lighting, strobes, and even props that physically move.

The biggest challenge for building these types of attractions is ensuring the synchronization of the various types of gear. This is where having a good show controller is critical since show control is essentially the synchronized automation of entertainment devices.   These devices require control interfaces like Serial (RS232), Ethernet, discrete IO, and DMX. Furthermore, this type of show control application requires a programming interface that allows for fine-tuning of timing.

This guide explains how to use the AV Binloop and AV Binloop Uncompressed to handle the playback for 3D projection and surround sound. It also ties in lighting and effect control using the V16X show controller. We'll even demonstrate how to implement common operator interfaces like a paging station using VPage and a touch panel interface using ShowTouch.

Integrating the System

As you can see from the application diagram, we're going to implement a 4K60 4D theater that incorporates lighting, door control, a fan effect, and a bubble machine. When it's time to load the theater, the doors will automatically open so that guests can find a seat. An operator at the

entrance of the theater will use a paging station to brief guests before starting the show with a touch panel interface. As the show begins, the house lights will dim and the 3D video will begin. This video will be projected by two 4K60-capable projectors that are aligned and that also utilize a 3D filter system that allows guests to wear passive 3D glasses. At precise moments during playback of the 3D video, the bubble machine and fans will activate. When the show is over, the exit doors will open and allow the guests to leave the theater. Once the exit doors close, the entrance doors will open for the next group of guests.

System Components

Let's take a look at the gear we have designed into this system and its role in implementing the 4D theater.

A/V Binloop Uncompressed – Multi-channel Synchronous Video Player

The purpose of this unit is to provide 2 perfectly synchronous channels of 4K60 uncompressed playback; one for the left eye image and the other for right eye image. Content is stored safely on solid-state media drives as uncompressed Targa sequences. This product physically connects to each projector using four 3G-SDI connections to allow transport of 4K60 video without the need for extension devices. This device also connects to the V16X show controller via Ethernet so that video clips can be played at the appropriate time and synchronized with other devices in the system.

A/V Binloop – Multi-channel Synchronous Audio Player

This unit provides the surround sound audio playback for this application and can source up to 32-channels of audio from a single box. Audio content is stored at 16-bit 48kHz uncompressed WAV files for excellent audio quality. The physical connection to the audio system (typically a DSP with supporting amplifiers) can be unbalanced analog, balanced analog, AES/EBU digital, Cobranet, or Dante network audio. This device also connects to the V16X show controller via Ethernet so that this product can be triggered in perfect sync with the video source (AV Binloop Uncompressed).

V16X – Show Controller

The V16X is the brain of this system. It is fully programmable using our free WinScript Live software and remotely controls all of the equipment in this application. This includes triggering AV playback in the AV Binloop and AV Binloop Uncompressed units. It also includes streaming DMX data to control the theater lighting and other DMX-based effects like fog machines, strobe lights, etc. Ethernet or serial connections to the projectors allow the V16X to control (power on/off, select input, shutter) and monitor status (lamp life, power state, etc.). It can even trigger IO-based effects using its built-in digital inputs and dry-contact relay outputs. As you can see in the diagram, we are using a few of the outputs to control the doors, fans, and bubble machines in this system. The V16X is also responsible for interfacing to the ShowTouch touch panel so that the operator can monitor system status and control the theater.

ShowTouch – Touch Panel Interface

These devices work in conjunction with the V16X to provide a customizable touch panel interface for users. This interface can be designed to be as simple or as complex as the application requires and can provide the ability to control the system as well as monitor status. You can use custom graphics to suit the client, like corporate logos, graphics, and color themes. ShowTouch can run on various hardware platforms which include our ShowTouch panels (available in 7", 10", and 17"), iPads, iPhones, as well as any Windows or OS-X based computer.

VPage – Networked Paging Station

This paging station is mounted in a standard 4-gang box next to the operator and connects back to the DSP platform via a POE Ethernet switch. The POE connection provides power for the VPage device while also allowing it to stream Dante network audio and control messages back to the DSP. When the operator presses the PTT button on the side of the microphone, the DSP system will duck the theater audio being sourced from the AV Binloop so that the announcement can proceed. When the PTT button is released, the DSP will raise the AV Binloop audio levels back to their normal operating level. The VPage has multiple buttons to allow for zone selection prior to paging. For example, you might utilize 3 buttons for this type of attraction; one for the preshow area, another for the theater, and a third zone to page to the entire attraction.

Audio DSP/Amplifier

Most attractions of this nature have an DSP to process audio to fine-tune sound to the unique environment. DSP's also perform other important functions like routing audio, mixing audio, paging logic, etc. Once the audio has been processed in the DSP system, it is often fed to external amplifiers to drive speakers throughout the attraction.

Network Infrastructure

Although it is not shown in the system diagram, it is implied that a system like this would consist of network switches, routers, and POE-enabled devices as needed. At the very least, a switch would be required to network all of this gear so that the V16X could connect to and control everything. A wireless bridge or router would be required if you wanted to integrate WIFI devices like a laptop running WinScript Live or an iPad running our ShowTouch app. For installations that utilize our VPage paging station, using a POE-enabled switch is certainly an attractive option to provide power to the VPage over the same UTP connection used for control and audio transport.

Content Creation

Content production ideally starts with two 4K60 Targa sequences; one for left eye and the other for right eye. These files are imported into Alcorn McBride MediaFlow and exported directly to the SSD drives of the AV Binloop Uncompressed using a standard SATA interface.
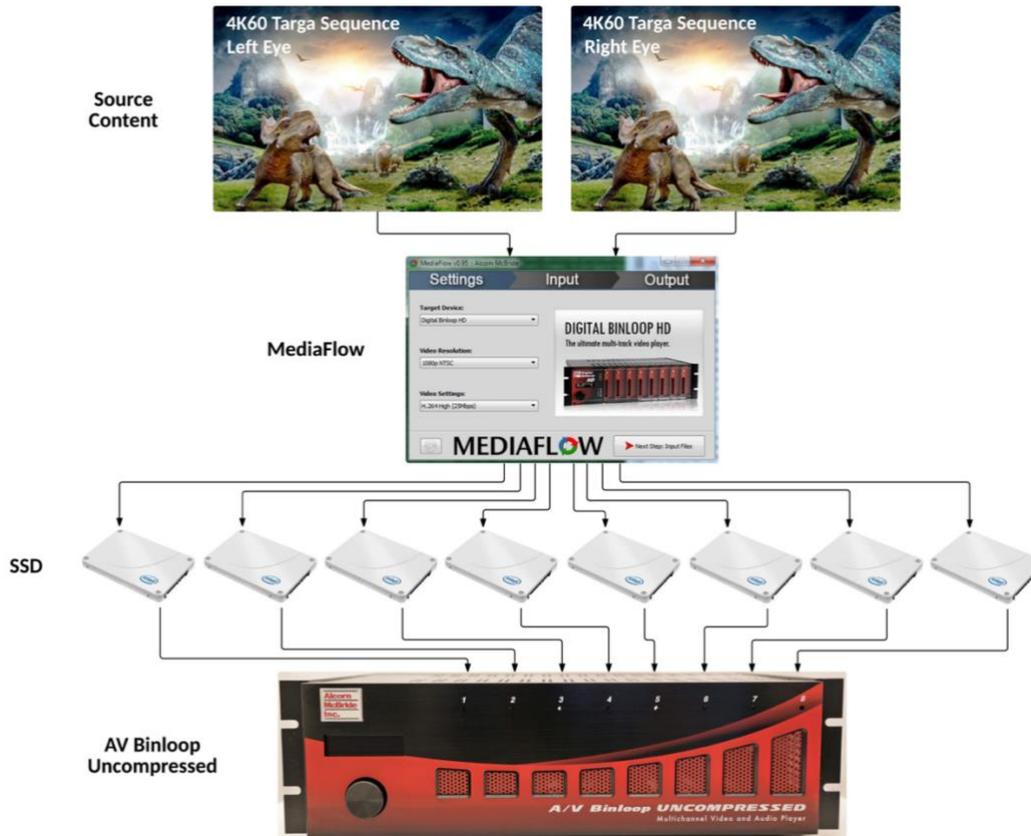
For 4K workflows like this, the 4K content must be cut into four quadrants of 2K and loaded to 4 separate drives. The nice thing is that MediaFlow handles all of this automatically and will even load the 4 drives simultaneously if they are all interfaced to the computer running MediaFlow.

Prior to exporting the clips to the drive, MediaFlow gives you the opportunity to name and number each clip. The name is helpful for identifying the clip when you are viewing the drive on a computer, and the number is important for show control purposes since the V16X will reference this number when it commands the Binloop to play a clip.

This process is repeated for both sources so that there are a total of 8 SSD drives loaded with content; 4 for the left eye and 4 for the right eye. Once MediaFlow has finished loading the drives, they should be properly ejected from the computer and inserted into the appropriate channels of the AV Binloop Uncompressed.

Implementing Control

Show control is a critical part of the system design since so many devices must work together to pull off this attraction. The V16X is responsible for starting Audio, Video, and Lighting content synchronously and then triggering doors, fans, and bubble machines during the show. The V16X must also work in conjunction with the ShowTouch panel so that the operator has the ability to control and monitor the show.

As demonstrated in the system diagram, we will be using a V16X to provide the control for the entire system. It will operate in conjunction with ShowTouch panels to provide the touch panel interface. Both the V16X and the ShowTouch devices are configured and programmed using our WinScript Live software.

Show Control Programming

To provide the flexibility required by various applications, the V16X show controller is a fully-programmable device. Using the WinScript Live software, we must configure the V16X so that it is aware of the devices that it will be controlling and the type of interface it will use to control them (i.e. RS232, RS422, DMX, Ethernet, etc.). The comprehensive library of devices supported by the V16X is constantly updated to make this as easy as possible.

In this 4D theater application, we must configure the V16X to communicate with the AV Binloop, AV Binloop Uncompressed, and Projectors. We must also create programming to control and monitor the show.

Although Alcorn McBride goes through great effort to make this programming significantly easier than many other control systems, there is a learning curve to using WinScript Live and the V16X. If you're looking to learn more about using this interface, Alcorn McBride offers free training in the form of interactive in-person classes and online courses.

For this example, we will be using the same WinScript Live project that contains the ShowTouch panel. This script file is called **4D Theater.WSL.**

Devices

A great first step when writing any script is to configure the list of devices that will be connected to the V16X. This involves browsing the comprehensive library of devices in the WinScript library by manufacturer and model number, choosing the device, and then configuring the physical connection to the device (i.e. Ethernet, Serial, etc.).

IO Configuration

Configuring the V16X's buttons, inputs, and outputs is also a good thing to do early on when creating the script. This process will allow you to name these resources so that their purpose can be easily identified as the script is created. For example, the outputs below have been named based on the purposes shown in the application diagram.

Sequences

Sequences are the heart of the show control script and contain all of the functional events that are programmed. Let's take a moment to walk through the key sequences contained in this example script.

First, there is a sequence called **Initialize** which does nothing more that fill the front-panel display of the V16X with some text. This is common practice since the V16X display is a handy way to display status information to operators and maintenance staff.

Then we have our **System_On** and **System_Off** sequences. **System_On** turns on the Projectors, waits for them to power up, and then triggers a looping logo and background music in the theater so that guests don't walk into a 'dead' theater. **System_Off** turns off the projectors and stops all playback.

Next, we have the 'Show Control' sequences that are intended to be used as control points for the show. These sequences perform the actions necessary to Start, Idle (loop video logo and background music), and Stop the show. The intention is that these sequences can be tied to control points like Inputs, Buttons, and touch panel buttons. Some of these sequences contain logic to prevent the show from running in special circumstances; like when the system is turned off.

Next, we have the main timeline of the 4D theater show; **Timeline_Show**. This timeline triggers synchronous playback of the Audio, Video, and Lighting tracks for the show. It is also responsible for triggering the theater doors and effects at precise times during the show. Timing can easily be tweaked for all of these elements simply by dragging them around the timeline.
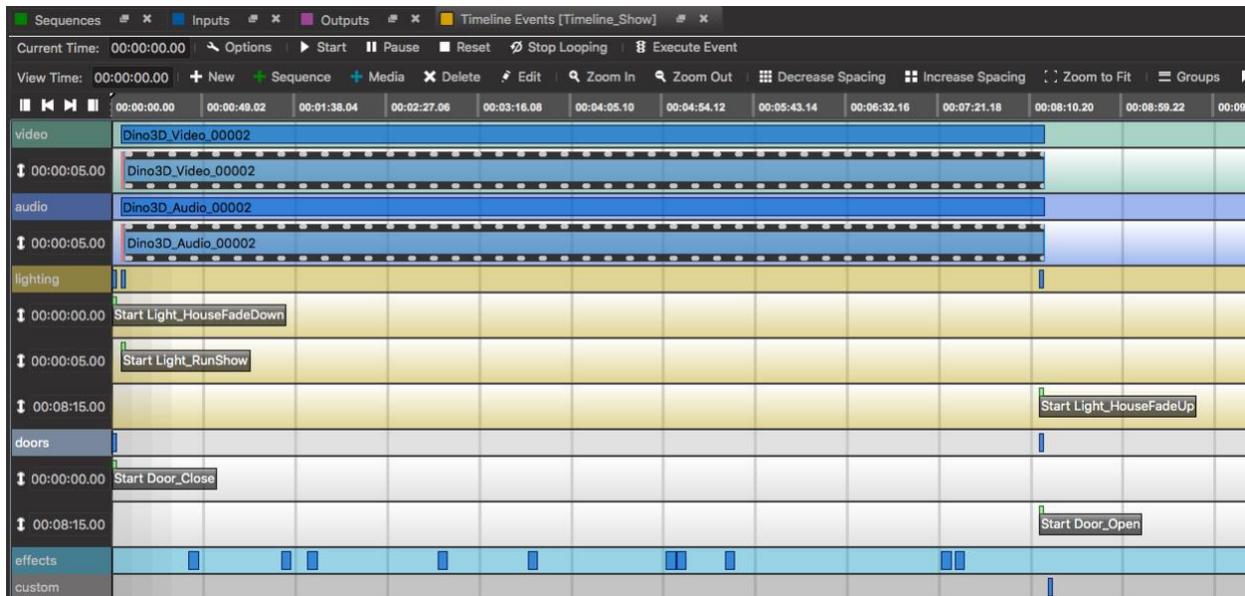
The next couple groups of sequences are very simple macros intended to trigger simple actions like opening/closing theater doors and triggering effects. The idea is that these sequences do whatever is necessary to perform that action so that they can be triggered by name from elsewhere in the script. For example, the main show timeline can easily start the **Effect_Fan** sequences to trigger the 5 second fan effect.

Last we have a few sequences dedicated to updating the front-panel display and touch panel text whenever status information changes.

Touch Panel Design

WinScript Live is a powerful tool for creating customized touch panel interfaces that can be deployed on ShowTouch enabled devices. Its flexibility allows you to cater the look and feel of controls and status readouts to suit the needs of the application. For a 4D theater application, we want to provide something that is designed to be used by a theater attendant. This interface should provide rather simple control to start and stop the show as well as monitor status of the show.