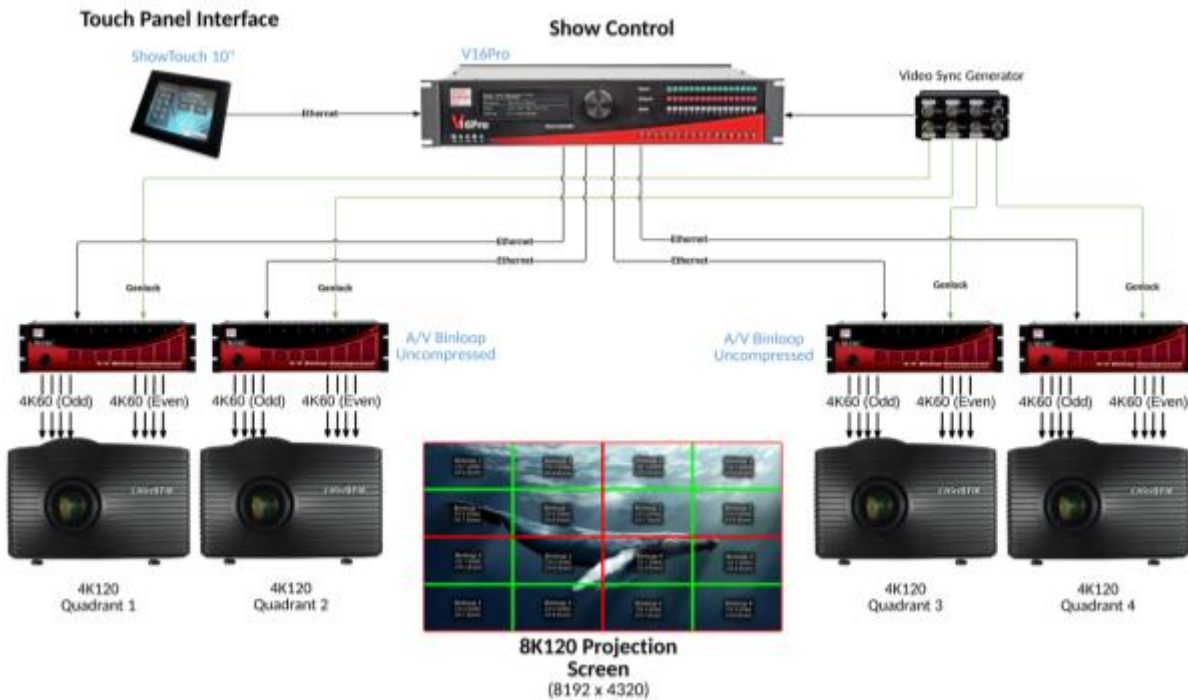# 8K120 Projection Application

Overview

Modern themed entertainment projects are pushing the limits of what current projection technologies can offer to provide the ultimate guest experience. In situations, such as rides, where guests are in close proximity to the projection screen, high resolution and high frame rate are essential to maintaining a good viewing experience. The superb uncompressed quality, high resolution, and high framerate playback offered by the AV Binloop Uncompressed make it ideal for these types of applications. Unlike PC-based server solutions, this product uses true Genlock to ensure perfect synchronization between units. This makes applications like 8K120 projection simple to implement with an ultra-reliable platform that's not going to ruin the show experience with pop-up windows, OS updates, or many of the other pitfalls associated with PC-based servers. When you add the flexibility of an Alcorn McBride V16Pro show controller and our ShowTouch panels, you can easily integrate synchronous control of other equipment while also providing operators with easy touch panel control, scheduling, and monitoring of the system.

How It's Done

Introduction

Whenever you have attractions with large video screens with viewers in close proximity, video quality, resolution, and frame rate are critical factors in ensuring a great experience. For the cutting-edge rides and shows in today's attractions, these growing requirements push video projection and playback technologies to the limits. This example is going to illustrate how Alcorn McBride products can be used to provide stunning 8K resolution video with a perfectly fluid 120fps playback rate.

In the past, this level of playback capability was only available from high-end computer-server technologies utilizing RAID arrays of storage drives. Aside from the stunning cost of these solutions, it's generally bad for the experience when Windows or OS-X messages pop up on the projector because the computer wants to update itself or inform you about a problem. Also, computers often get bogged down with other non-essential tasks that can result in poor playback performance. Instead of getting a nice smooth 120fps video, you risk stuttering and synchronization issues. RAID arrays also complicate matters greatly when drives fail and need to be swapped.

When combined with the right projectors, the AV Binloop Uncompressed offers a scalable solution that can adapt to the needs of your attraction. This is a solid-state solution that was purpose-built for high-quality high frame rate playback. It is not a computer-based player, so you get smooth playback with clean window-free video on the outputs every time. All from hardware that has been designed to last for many years with no maintenance.

Integrating the System

To clearly demonstrate the advantages that Alcorn McBride Show Control and the A/V Binloop Uncompressed bring to high-end projection systems, we will implement an 8K120 theater in this application. This requires a total of 4 perfectly synchronized 4K120 (4096x2160) sources fed to 4 edge-blended 4K projectors.

We'll even utilize ShowTouch to provide nice touch panel interfaces to monitor things like projector health and provide control of the attraction.

System Components

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

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

The purpose of each unit is to provide a single channel of 4K120 uncompressed playback. Using a video sync generator and it's included Genlock feature, four of these units will be synchronized to form the entire 8K120 image.

Content is stored safely on solid-state media drives as uncompressed Targa sequences. This product physically connects to each projector using eight 3G-SDI connections to allow transport of 4K120 video without the need for extension devices. This device also connects to the V16Pro show controller via Ethernet so that video clips can be played at the appropriate time and synchronized with other devices in the system.

V16Pro – Show Controller

The V16Pro 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 Binloop Uncompressed units so that they playback synchronously. Ethernet or serial connections to the projectors allow the V16Pro to control (power on/off, select input, shutter) and monitor status (lamp life, power state, etc.). For applications that have the need, it can even trigger IO-based effects using its built-in digital inputs and dry-contact relay outputs. The V16Pro 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 V16Pro 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.

Projectors

Not many projectors are capable of this level of playback capability. For this application, we recommend using 4K projectors with the following features:
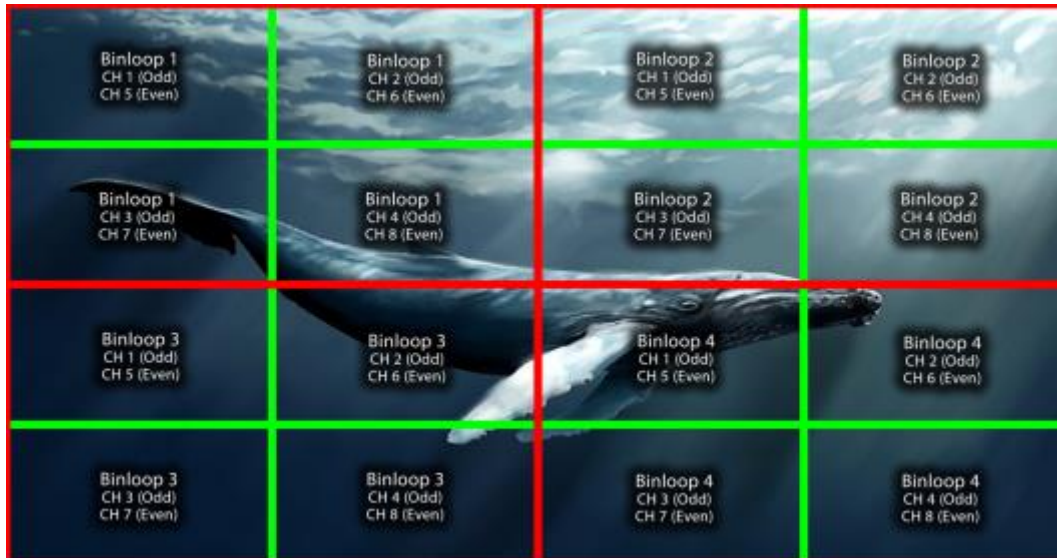- 120Hz output
- 8 x 3G-SDI Inputs
  - 4 inputs for 4K60 'Odd' frames
  - 4 inputs for 4K60 'Even' frames
- Built-in blending capability
- Built-in warping capability (for non-standard screen geometry)

Network Infrastructure

Although it is not shown in the system diagram, it is implied that a system like this would consist of network switches and routers as needed. At the very least, a switch would be required to network all of this gear so that the V16Pro could connect to and control all of the devices. 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.

Content Creation

Producing 8K120 projection requires edge-blending four 4K120 projectors. Each projector is connected to an AV Binloop Uncompressed and requires a total of 8 reproducer channels to produce the 4K120 image. 4 channels combine to play 4K60 odd frames, and the other 4 channels combine to play 4K60 even frames. This graphic illustrates how the complete 8K120 image is divided:

As you can see, the ultimate goal is to produce 32 channels of Targa sequence files that will be played synchronously.

File Naming

When it comes to playback control, the Binloop uses a file numbering convention to identify and play files. For example, if we send the control message "Play Clip #1 on All Channels" to the Binloop it will analyze the Targa folders on the storage media to find the clip that is properly named to be clip #1. The clip number is determined by a 5-digit number at the end of the folder name. Here's an example:

B1C1_HumpbackShow_00001

As you can see, the folder name ends with "00001" which the Binloop identifies as being clip #1. Any text located before these numeric digits is completely optional and can be anything you want. For the sake of organization, the example above uses this text to provide a nice description of the clip. For example, "B1C1" indicates that this file was created for Binloop 1 Channel 1. "HumpbackShow" is a description of the clip itself. This text has no functional meaning to the Binloop, but it sure is nice for helping a user to identify the clip at a glance. When synchronizing clips between multiple channels, the most ideal practice is to keep the clip numbers the same for each presentation. For this application we are creating a

"HumpbackShow" video that will span across 4 Binloops and 8 channels per Binloop. That being the case, it would be best to name them like this:

B1C1_HumpbackShow_00002
B1C2_HumpbackShow_00002
…
B4C7_HumpbackShow_00002
B4C8_HumpbackShow_00002

Another set of video files for a different presentation might look something like this:
B1C1_OrcaShow_00003
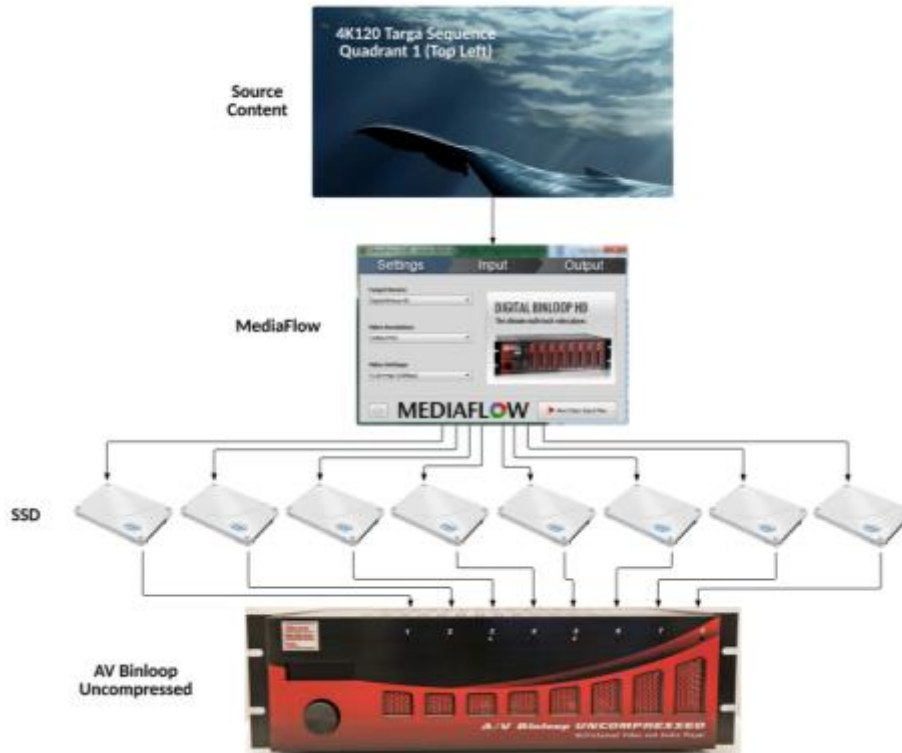**B1C2_OrcaShow_00003**
…
B4C7_OrcaShow_00003
B4C8_OrcaShow_00003

When the files are named properly like this, all we have to do is tell the Binloops to "Play Clip 2" or "Play Clip 3" to trigger the different presentations.

MediaFlow

We will tackle the workflow by processing the 4K quadrants one at a time with MediaFlow.

When MediaFlow is provided with 4K120 source content it will process and export Targa files to a series of 8 SSD devices that correspond with the 8 playback channels in the Binloop. Channels 1-4 will source the "odd" video frames and channels 5-8 will source the "even" video frames.

The quickest and easiest way to load content to the SSD drives is by interfacing to them directly from a computer using a SATA adapter. A USB 3.0 SATA adapter is included with every AV Binloop Uncompressed for this purpose. In the case of 4K120, you have the option of interfacing all 8 drives to the computer at once. If you do this, MediaFlow will load all 8 drives simultaneously. You also have the option of loading the drives one at a time if you wish.

Once content is loaded to the drives and indexed by MediaFlow, be sure to properly 'eject' them from the computer before unplugging them from the adapter. The SSD drives can then be re-inserted into the AV Binloop Uncompressed.

Once you have loaded 8 drives with your 4K120 content, you must repeat the process for the remaining 4K120 quadrants.

Implementing Control

A show controller adds a great deal of flexibility to this system design. It can provide users with a touch panel interface so they can monitor and control the system. It's also used to automate the various components of the system (Binloops, Projectors, lighting system, etc.).

As demonstrated in the system diagram, we will be using a V16Pro to provide the control for the entire system. Its primary responsibility will be to ensure that all four Binloops start synchronously to produce a perfect 8K120 image. The V16Pro will also control and monitor the projectors via Ethernet or RS232. ShowTouch panels will work with the V16Pro to provide operators with a touch panel interface. This interface can do things like provide controls for the show, display show status, and display projector health. Both the V16Pro and the ShowTouch devices are configured and programmed using our WinScript Live software.
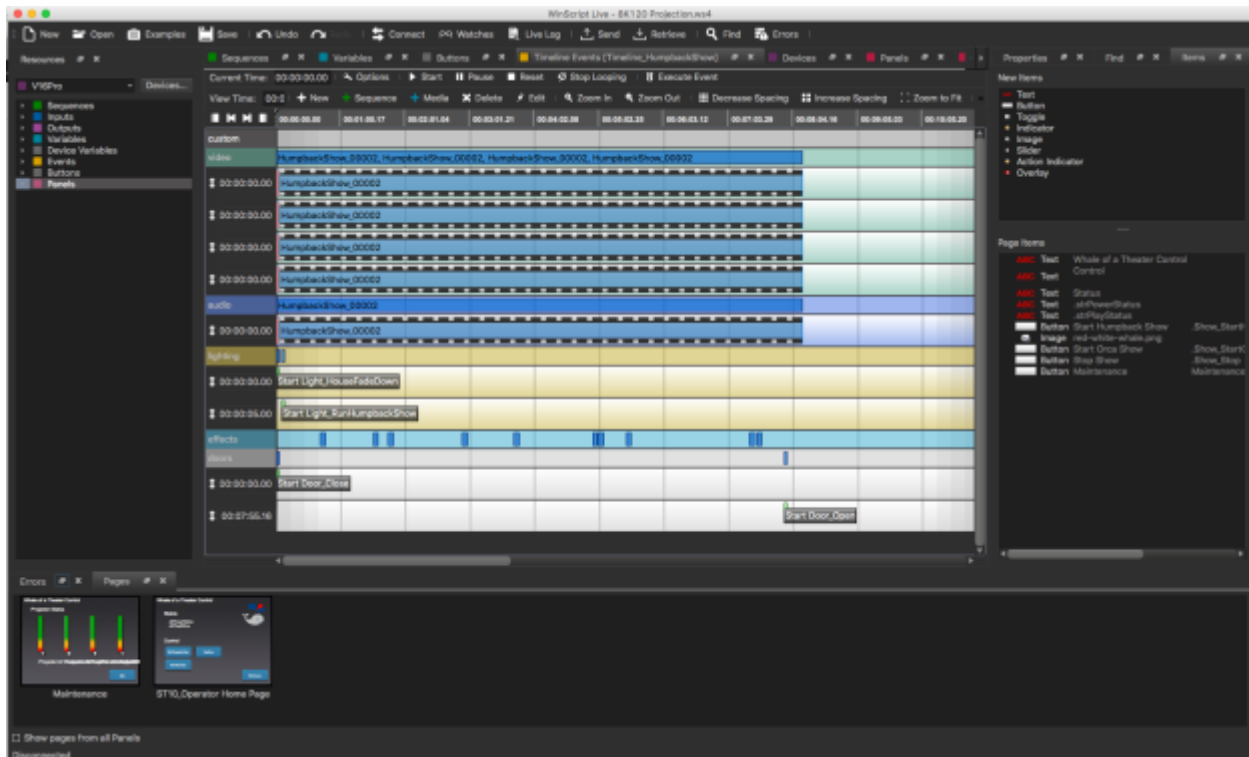
Show Control Programming

To provide the flexibility required by various applications, the V16Pro show controller is a fully-programmable device. Using the WinScript Live software, we must configure the V16Pro 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, MIDI, Ethernet, etc.). The comprehensive library of devices supported by the V16Pro is constantly updated to make this as easy as possible.

In this application, we must configure the V16Pro to communicate with the AV Binloop Uncompressed and the projectors. We must also create programming to trigger the various presentations when buttons are pressed on the touch panel.

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 V16Pro. 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 **8K120 Projection.WS4.**

Devices

A great first step when writing any script is to configure the list of devices that will be connected to the V16Pro. 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.). For this application, we need to add our 4 projectors and 4 AV Binloop Uncompressed units. For the sake of using a real world example, we're actually going to add a Digital Binloop for audio playback and a LightCue Pro for lighting control as well.

#	D	Name	Device Type	Protocol	Connection	Details	Comments
1	☐	V16Pro	Alcorn McBride, Inc. – V16Pro	local	Unit ID: 0	Unit ID: 0	
2	☐	AVBU-Q1	Alcorn McBride, Inc. – A/V Binloop Uncompressed	ASCII	ethernet A	UDP:192.168.1.201, 2638	Video – Quadrant 1 – Top Left
3	☐	AVBU-Q2	Alcorn McBride, Inc. – A/V Binloop Uncompressed	ASCII	ethernet A	UDP:192.168.1.202, 2638	Video – Quadrant 2 – Top Right
4	☐	AVBU-Q3	Alcorn McBride, Inc. – A/V Binloop Uncompressed	ASCII	ethernet A	UDP:192.168.1.203, 2638	Video – Quadrant 3 – Bottom Left
5	☐	AVBU-Q4	Alcorn McBride, Inc. – A/V Binloop Uncompressed	ASCII	ethernet A	UDP:192.168.1.204, 2638	Video – Quadrant 4 – Bottom Right
6	☐	DBIN	Alcorn McBride, Inc. – Digital Binloop (32 track)	ASCII	ethernet A	UDP:192.168.1.211, 2638	Audio
7	☐	Projector-Q1	Christie – Mirage 4K	ASCII	ethernet A	TCP:192.168.1.221, 3002	Proj – Quadrant 1 – Top Left
8	☐	Projector-Q2	Christie – Mirage 4K	ASCII	ethernet A	TCP:192.168.1.222, 3002	Proj – Quadrant 2 – Top Right
9	☐	Projector-Q3	Christie – Mirage 4K	ASCII	ethernet A	TCP:192.168.1.223, 3002	Proj – Quadrant 3 – Bottom Left
10	☐	Projector-Q4	Christie – Mirage 4K	ASCII	ethernet A	TCP:192.168.1.224, 3002	Proj – Quadrant 4 – Bottom Right
11	☐	LightCuePro	Alcorn McBride, Inc. – LightCuePro	pioneer	ethernet A	UDP:192.168.1.231, 2639	Lighting
12	☐						

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.
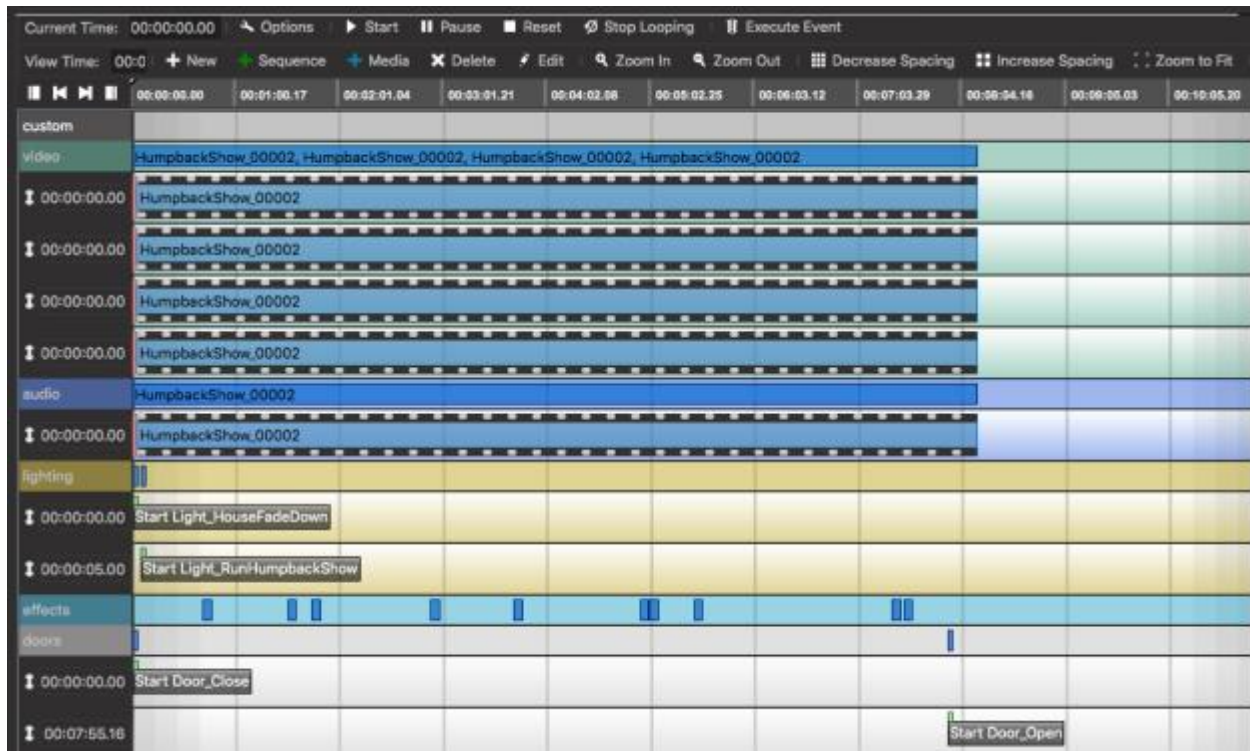
#	D	A	L	Status	Sequence Name	Triggers	Comments
1	☐ ☒ ☐	■ ❚❚ ▶	Initialize			Power-on Initialization
2					
3			◢ System Control		
4	☐ ☐ ☐	■ ❚❚ ▶	System_On	▶ button15_SystemOn goes on	Day Mode - Turn On System
5	☐ ☐ ☐	■ ❚❚ ▶	System_Off	▶ button16_SystemOff goes on	Night Mode - Turn Off System
6					
7			◢ Show Control		
8	☐ ☐ ☐	■ ❚❚ ▶	Show_Stop	▶ button1_StopShow goes on	Stop Show - Stop Video, Audio, and Lighting
9	☐ ☐ ☐	■ ❚❚ ▶	Show_Idle	▶ button2_IdleShow goes on	Idle Show - Background Music and Looping Logo Video
10	☐ ☐ ☐	■ ❚❚ ▶	Show_StartHumpbackShow	▶ button3_StartHumpbackShow goes on	Start Show - Humpback Whale
11	☐ ☐ ☐	■ ❚❚ ▶	Show_StartOrcaShow	▶ button4_StartOrcaShow goes on	Start Show - Orca Whale
12					
13			◢ Timelines		
14	☐ ☐ ☐	■ ❚❚ ▶	Timeline_IdleShow		Idle Timeline
15	☐ ☐ ☐	■ ❚❚ ▶	Timeline_HumpbackShow		Show Timeline - Humpback Whale Show
16	☐ ☐ ☐	■ ❚❚ ▶	Timeline_OrcaShow		Show Timeline - Orca Whale Show
17					
18			◢ Light Control		
19	☐ ☐ ☐	■ ❚❚ ▶	Light_HouseFadeUp		Fade Up House Lights
20	☐ ☐ ☐	■ ❚❚ ▶	Light_HouseFadeDown		Fade Down House Lights
21	☐ ☐ ☐	■ ❚❚ ▶	Light_RunHumpbackShow		Run Humpback Show Lighting Cue
22	☐ ☐ ☐	■ ❚❚ ▶	Light_RunOrcaShow		Run Orca Show Lighting Cue
23					
24			◢ Door Control		
25	☐ ☐ ☐	■ ❚❚ ▶	Door_Open		Open Theater Doors
26	☐ ☐ ☐	■ ❚❚ ▶	Door_Close		Close Theater Doors
27					
28			◢ Effect Control		
29	☐ ☐ ☐	■ ❚❚ ▶	Effect_Fan		Fan Effect
30	☐ ☐ ☐	■ ❚❚ ▶	Effect_Scent		Scent Effect - What do whales smell like anyway?!?
31					
32			◢ Projector Control		
33	☐ ☒ ☒	■ ❚❚ ▶	Projector_MonitorLampHours		Monitor Lamp Hours

First, there is a sequence called **Initialize** which does nothing more that fill the front-panel display of the V16Pro with some text. This is common practice since the V16Pro 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 show timelines; **Timeline_HumpbackShow** and **Timeline_OrcaShow**. These timelines trigger synchronous playback of the Audio, Video, and Lighting tracks for each show. They are also responsible for triggering the theater doors and effects at precise times during each 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.

Next we have a sequence dedicated to monitoring the lamp hours of the projectors. This sequence is configured to query all 4 projectors for their lamp hours every 5 minutes. These queries fill lamp hour variables for each projector, which can then be displayed on the touch panel.

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 this 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. It should also provide the ability to monitor to health of the projector lamps.

Conclusion

This application note can serve as a starting point in implementing your own 8K120 projection application. Keep in mind that this design can easily be scaled up or down depending on the resolution and framerate of your application. You can genlock additional Binloops to achieve higher resolutions.

Now it's time for you to implement your own projection project with the AV Binloop Uncompressed and V16Pro. Please don't forget that we are here to help you so feel free to contact us with questions.