

imitating the dog:

Video Design and Projection Mapping – Technical Plan

How the video system works, with Simon Wainwright

introduction

This document describes the technical basis of imitating the dog's video system: how content is made, how it travels through the system to the projectors, and how it's controlled during a show. It's written for design pathway students and teachers who want a clear mental model of how the system works, rather than a full technical specification. The words are Simon's own, edited from a written interview into continuous prose. This document also carries the full explanation of the signal chain shared by all three departments — video, sound and lighting — which the lighting and sound technical plans refer back to rather than repeat.

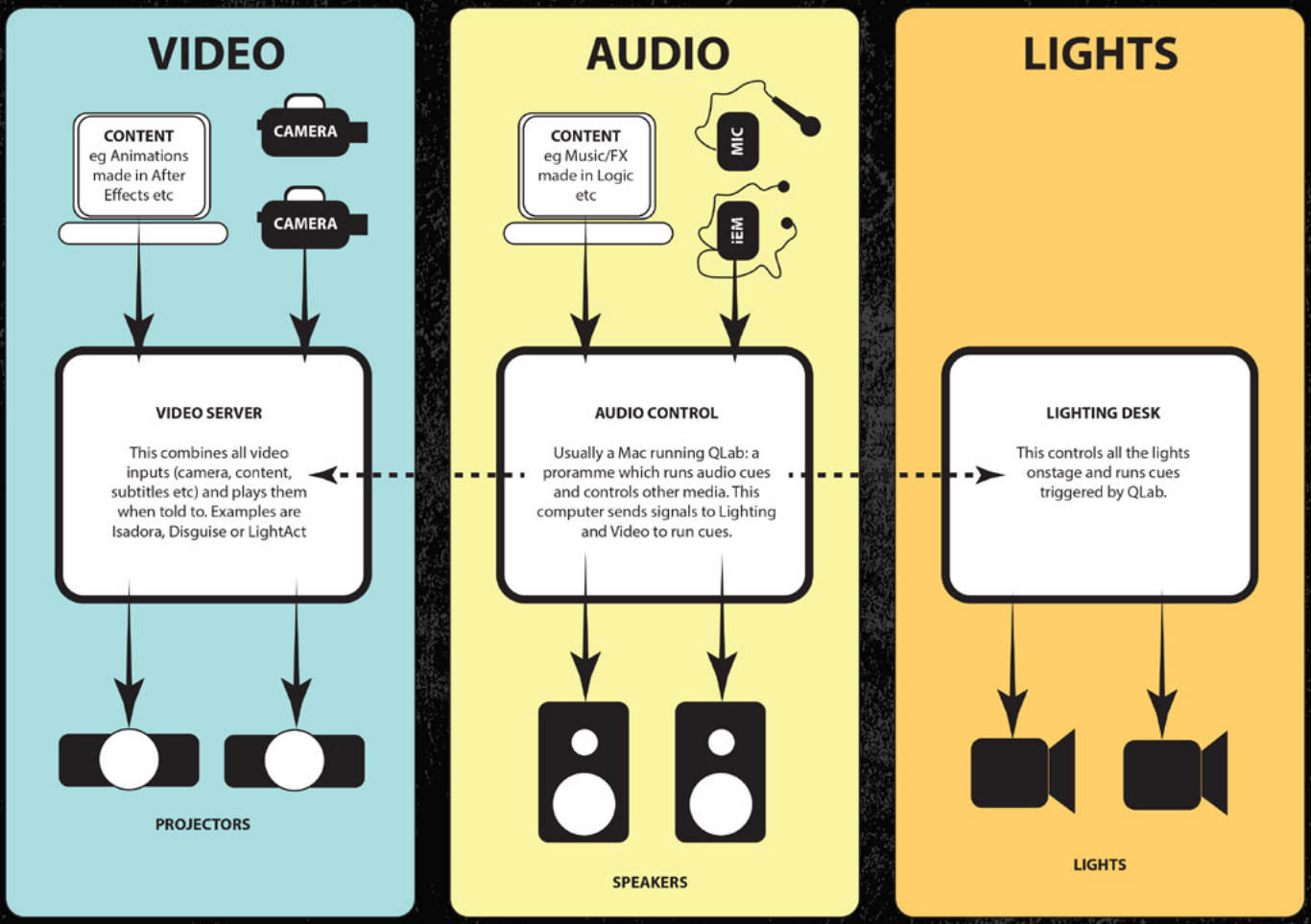
› Read this alongside the companion document: Video Design and Projection Mapping: Simon Wainwright interview (Section 3).



Heart of Darkness (2018)

the system

The signal chain



The general signal chain for an ITD theatre show: three departments (video, audio and lighting), each making and controlling content, connected by OSC so that one machine can trigger them all.

This is the general signal chain for an ITD theatre show. We basically divide into three departments, with each one making content to be controlled in some way. Video uses a 'video server' to organise and play content and make camera edits. Sound uses a QLab computer to run audio cues and control mics and IEMs (in-ear monitoring). Lighting controls all the lights through a lighting desk. These three areas then talk to each other via a protocol called OSC. This allows one machine (in our case the sound QLab computer) to control all the other machines, and allows for a simple, precise and fluid operation of a show. We end up with a single 'cue stack' sending triggers to all the other departments.

Making the content

The content for our theatre and installation work is made in two different ways.

Typically, on an installation piece (projection mapping, normally for an outdoor festival), we work to very strict timed storyboards, and make almost all of the content in After Effects. We sometimes use other packages for specific jobs (including Photoshop, Runway, Cinema 4D and live filming), but After Effects is where we pull it all together and do the bulk of the animation. As we usually only have one night before a festival to line up the projector and test the footage, all content is made before we get to site, and only small changes are made on the install. Shows generally run as one long file, with no cues in the sequence.



Storyboard for *Dear Joan...* (2025)

Our theatre shows are very different. Animations and video backdrops are made in the same way as above, but in small chunks, for each cue. This is then laid out on a timeline in a video server, where we also control and interact with cameras and other media. We often enter a rehearsal process with almost no content pre-made, and the creation and programming of the material is a very organic process through four or five weeks. The video server allows us to make the show as we go along, mixing together our camera feeds and various animations, while also sometimes making content and effects in real time.

The live camera system

We often use Sony cameras because of their light weight, cost and (most importantly) lack of lag. Lag — the time it takes for a signal to get through the camera and to a screen — is a real problem, and we try to minimise it as much as we can. The camera feeds are routed into the video server, as shown in the signal chain diagram.



War of the Worlds (2026)

Generally, the mixing is pre-defined and built into cues, which are either triggered by a show operator or run to time using something called timecode. This is a control system that keeps audio, video and lighting in sync with each other over a period of time. So we have parts of the show that are a series of manual cues triggered by an operator, and we also have sections that have a single 'go' button and can then run for as long as we want. Typically, dialogue uses manual cues, and 'set pieces' (chases, opening sequences, dances) use timecode. We never 'live mix' cameras; it's all pre-programmed.

Control during a show

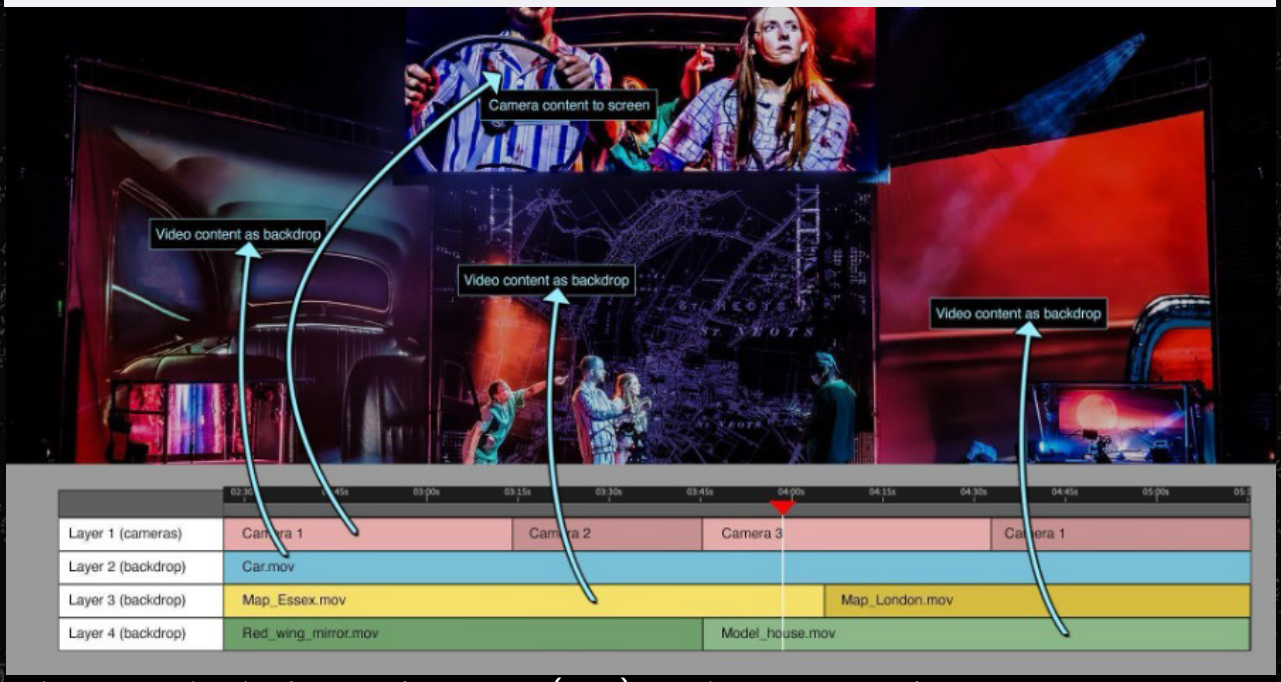
Generally the whole show has one operator, so we're pretty light on our feet as a company. Normally the sound computer running QLab fires all of the cues. It sends triggers, using a protocol called OSC, to tell the lighting desk and video server to run cues at the same time. Part of our process is to make all of these things work from a single button press. Normally on a theatre show this would be done in tech week, after the show has been rehearsed, but we tend to build the show from day one, as we make it.
A show is pretty locked down, but the show operator can normally adjust the timings of cues and move with the flow of the performance.

Working Example: How do we make a live camera sequence in something like *War of the Worlds*?
All shows vary in the process and the software system used to put them together, but here is a step-by-step process of how we *might* make one of our live-camera shows.

1. **Make a storyboard.** It's almost impossible to put a complex live camera sequence together without a storyboard. We're always trying to make convincingly realistic cinematic shots in an abstract stage world, so you need to know the shot you're aiming for in order to construct it.
2. **Frame the shot in the space using a rough backdrop.** The shots usually use a combination of props and a video backdrop. It's hard to know the exact backdrop you will need, with the right angles and lighting, until you have made the shot, so we normally put something temporary in from a bank of premade material (using stock, animation, drawn images: whatever is right for the show)
3. **Light the shot:** We have to find a balance between making the shot look convincing on camera but also lighting for the stage.

4. **Develop the backdrop with the final content:** Using whatever software or process is right for the show. In the case of *War of the Worlds*, this was a combination of AI-generated imagery (using Runway) and After Effects.
5. **Move on to the next shot!**

The software we use varies from show to show, but the image below shows what a timeline-based programme (Light Act, Disguise, etc) would look like:



A video server timeline for *War of the Worlds* (2026), showing how camera feeds and backdrop layers reach the screens

practical guidance for students

Getting started

The minimum equipment you need is a computer and a projector! Small objects in dark rooms can be mapped with the smallest and cheapest of projectors and some free software. A programme called Isadora, which we use for a lot of our shows, allows you to play and learn (without saving) for free, so it's easy to get started.

Common problems and fixes

Most technical problems are solved by changing cables and working your way down the signal chain, swapping out parts until you find the faulty cable or adapter. With touring shows there's a lot of wear and tear, so it's easy for a cable or plug to become broken and send the whole system into meltdown!

glossary

Video server/media server — The computer system that stores, organises and plays all video content, combines it with live camera feeds, and sends the result to the projectors. Examples include Isadora, Disguise and LightAct.
Signal chain — The path a signal takes through the system, from source (camera, computer) through processing to output (projector, speaker, light).
OSC — A simple network protocol that lets one machine send commands to another. In ITD's system, the QLab computer uses OSC to trigger the lighting desk and video server, so all three departments fire their cues from a single button press.
Cue stack — The ordered list of every cue in the show, played back one button press at a time.
Timecode — A running clock signal that keeps sound, video and lighting automatically in sync during set-piece sequences.
Lag (latency) — The delay between something happening in front of the camera and it appearing on screen. Too much lag breaks the illusion of liveness.
IEM (in-ear monitoring) — An earpiece feed to performers, used for timing, staying in sync with pre-recorded material, or hearing a click or voice feed.
After Effects — Adobe's animation and compositing software, used to make ITD's pre-made video content.

› Try it yourself: the Live Cinema Workshop (Exercise 2) and The Camera as Character (Exercise 8) in Adaptation and imitating the dog: Practical Exercises (Section 4).

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Photography of *War of the Worlds*: Ed Waring.