Project guide

Large scale Immersive Environments

The location based entertainment market has recently seen significant growth in large scale immersive environment experiences. For the first few years of their existence, the installation of these environments has been an expensive, difficult and time consuming process. Thanks to new technology from HIVE the commissioning process has become easier, quicker & much more cost effective.

This guide will walk the reader through the project preparation requirements to create such an installation using the HIVE product range. Following this guide should ensure that the systems integration engineers are well prepared to deliver the project successfully. Please note that this document focuses exclusively on the technical side of such a project. Rigorous project planning for the creative teams is also very important on a project like this, but that falls outside of the scope of this document.

BBC Earth Experience Melbourne 2023 (Photo taken during the commissioning phase).

The Seven P’s

Proper Prior Planning Prevents Pretty Poor Performance

If you take one thing away from reading this guide, please let it be this statement. A large scale Immersive Environment project requires significant effort in the pre production phase. If adequate preparatory work is not completed, then you should expect to experience problems during commissioning.

This document is intended to outline what steps you will need to take to prepare for a large scale immersive environment project. It will not go into any details of the Hive software operation, if you need that information, please head over to our video tutorials at https://hive.run/support-tutorials.

We have also included a brief overview of the tasks you will need to be prepared to do during the installation, commissioning and operations / maintenance phases. Reviewing this information will also help you to prepare for your project.

Table of contents

2. Testing phase

2.1 Hardware compatibility testing

2.2 Full system test

2.3. Camera calibration practice

3. Installation phase

3.1 Installation considerations

4. Commissioning phase

4.1 Video Mapping

4.2 Media distribution

4.3 Show sequencing

1. Pre production phase

1.1 Scheduling

Crew requirements

We would suggest the following positions are filled in the technical team:

Lead Video Technician

The lead video technician should have significant experience within all aspects of the project, hardware installation, video mapping, show control. This person should also be good at managing the other team members below, to ensure that everyone is progressing within their area. This person will likely need to spend a lot of time discussing the progress on the project with your client team, so they should be a good communicator both technically and non technically.

Video Technicians

Should have good experience within all aspects of the project, hardware installation, video mapping, show control. The quantity of video technicians will depend on how many projector outputs you intend to use on your project and also how many shifts you need to run during the 24 hour period. Don't forget that technicians perform their job at their best when they have had plenty of sleep.

Projectionists

The projectionists should have good experience of projector installation, video mapping, show control. The quantity of projectionists will depend on how many projector outputs you intend to use on your project and also how many shifts you need to run during the 24 hour period. Don't forget that technicians perform their job at their best when they have had plenty of sleep.

Network Specialist

An installation of this nature relies heavily upon a fully functioning network. Therefore, an experienced network engineer is an essential role to fill in your project. There will be many devices all competing for bandwidth on your network. If the network goes down, everybody has to stop working. This role is all to often overlooked, inadequate provision in this area can be the downfall of an otherwise well executed project.

Additional Roles - not covered by this document

Content creation team

Audio engineers & Installer

Riggers

Production team

+ many more depending on your project. Sometimes these projects can have up to 50-100 people or more on the crew list including all departments.

How long will it take?

The exact duration for the execution for a large scale immersive installation will depend upon many factors. It is important to plan this carefully and allow adequate time for each part of the project to be to be completed comfortably.

As a rough guide we usually see these project installations take something in the range of 6-12 weeks.

Some useful metrics that we would suggest you use in your planning are as follows:

Projector Installation

Roughly 1/2 a day per projector per projectionist is a reasonable guide. This includes time to mount the projector and configure it ready for use.

Video Mapping

As a guide, roughly 1 or 2 man nights per screen group of around 4-8 projectors. Note this work often has to be done at night when everyone else has stopped working in the venue. The initial mapping can be done quickly, but then there is often a requirement to optimise the edge masks and perform black level calibrations etc. As a real world example we recently completed a x55 projector mapping with a team of 4 people and the video mapping alone took 2 weeks. It is also worth noting that once the screens are moved or projectors moved then the mapping often has to be repeated.

Show Programming

Allow roughly 24-48 hours for each content revision on a large project, don't forget to allow additional time for media download on a slow bandwidth connection.

Don't forget to add time to your schedule for:

Any final content adjustments & grading on site. The duration for this should be determined with your content creation team.

Any final audio adjustments & mastering on site. The duration for this should be determined with your audio team.

If possible add some contingency, planning to complete your video mapping or show programming the night before the doors open is a recipe for disaster!

Also don't forget that often things don't go exactly to plan on site. With all the planning in the world, issues still present themselves, that just cannot have been planned for. Like a drape casting a small shadow on the top of the screen in this picture.

The Legendary Selvin Cooper & unforeseen problems.

1.2 Equipment specification

Projectors

The backbone of an immersive installation is the projectors. We usually recommend Panasonic projectors. We have been working with them for over 15 years and they are the best choice for this project for a number of reasons:

- Reliability

- Image quality

- Colour consistency between units.

- Compatibility with our BeeBlade product

They are not the cheapest option, but in the long run of your project the extra investment will most likely pay off. As the old saying goes, ’You get what you pay for!’

X19 Panasonic Projectors in the National Museum of Qatar 2019 (Photo by Antonio Pagano)

Media players

For large scale Immersive Installations we are now recommending our BeeBlade product range. They have been designed from the ground up with Immersive installation projects in mind.

The SDM form factor allows you to insert the beeBlade product directly into the projector housing, into the dedicated SDM slot.

If your projector does not use an SDM slot then we have 2 alternative options with the same BeeBlade product.

You can purchase the beeBlade in its own small enclosure, to create a stand alone media player device.

Or you can also use our BeeHive product, which allows up to 16 beeBlades to be inserted into the 5RU enclosure in a vertical blade style.

The beeBlade range offers our beeSync feature which uses PTP and a proprietary HDMI clock control system to guarantee the vertical sync of all of the beeBlade outputs is locked in sync.

Mapping cameras & lenses

We recommend using a camera based warp and blend tool to ensure the best blend quality and warping between multiple projectors on a large surface.

We recommend the Imaging Source DFK 33GX183 camera. This camera is a GigE RJ45 ethernet camera with a resolution of 5472 x3648 on a 1” Sony Exmor sensor. The high resolution and good sensor quality makes it an excellent choice for this application.

The lense specification will depend on the shape & dimensions of your screen surface. We often use the Kowa LM4HC lens which is a 1” C Mount 4.7mm lens with a manual iris and a very wide field of view with relatively minimal distortion.

As a general rule, you should try to place the camera and lens as far away from the screen surface you wish to map, and use the narrowest field of view you can, whilst still keeping a 10% margin around the screen area.

Mapping software

Our software of choice for the camera based warp and blend process is called Screenberry, this can be purchased along with your Hive hardware. The Screenberry software is a very powerful suite of node based programming tools. We can provide tutorials to learn to use this software and we can support you through the mapping process.

The user installs and runs the Screenberry software on a windows laptop. The software requires a USB dongle which can be purchased from the Hive team.

You then connect to the ethernet camera mentioned in the previous section through the Screenberry software.

The Screenberry software sends calibration patterns to the Hive players. The camera captures images of the calibration patterns as they are projected onto the surface by each projector.

The Screenberry software reads those images from the camera over the network, it the processes each image and works out how to blend the projectors together.

Once a projection canvas is determined which spans all of the projectors, the user can use bezier warp tools or 3d models to decide how their images should be placed on the projection canvas.

The calibration files are then exported from the Screenberry software, they are then imported into the Hive player, and the Hive player uses these calibration files to ensure that the video files and other media played on the Hive Player are aligned to the screen surface and blended across the projectors.

We would strongly recommend that you learn to use the Screenberry software well in advance of the installation of your project. Perhaps build a scale model and practice on there.

As a minimum we would encourage users to prepare their Screenberry project files for each of their projection surfaces well in advance of going to site, this will help to ensure that the mapping process goes smoothly on site. If you turn up on site hoping to do a complex video mapping project having not properly prepared, you will be likely to fail.

If you would like to find out more about the Screenberry software and how to use it to map complex surfaces with your Hive players please don't hesitate to get in touch for more information at support@hive.run

Control laptops

The Hive players can be accessed and configured from any laptop or iPad and even your phone. However, we would recommend windows control laptops with a dedicated GPU and at least an i7 processor, because the Screenberry software which does the camera based warp and blend calculation requires a system with reasonably good performance.

We often recommend Razor, Dell or Lenovo laptops. But any windows laptop will do. Apple laptops are also fine for configuring the Hive players, but for the Screenberry software you will need a windows machine (as of writing Autumn 2023).

Network infrastructure

It is mission critical that you install good quality network equipment and someone on your team understands how to configure it. We can offer advise on some aspects of the network setup, but your team will need to take responsibility for it. We often use Netgear unmanaged switches on smaller installations, then on larger installations we use the Netgear AV series of switches, or some customers prefer to use other brands such as Ubiquity & Cisco.

We encourage users to put our systems on a dedicated network if possible with no other systems on the network. If this is not possible, then at very least we need a dedicated VLAN for our systems to live on. We produce lots of Artnet Broadcast data and we rely on high speed time critical services such as PTP and ArtNet timecode.

We insist upon sufficiently fast switches that allow unfiltered / unblocked communication between our devices and any device they are expected communicate with. When something isn't working as expected, our support team will need to be able to check and see whether anything is being blocked or filtered & monitor overall network usage. If this information is not available you should expect delays to your installation, so it is imperative you ensure these network monitoring tools are in place before you begin your installation.

Our beeSync system relies on PTP (Precision Time Protocol). If any other devices on our network also use this protocol then conflicts may occur. We have seen conflicts from cameras, sound equipment etc which use PTP, if possible the PTP on these devices should be disabled or they should be placed on another network or VLAN.

Remote control software

The Hive systems have been designed from the ground up to be fully supportable remotely. So we recommend that you install Anydesk or Teamviewer on your control laptops before you go to site. This will allow you to access your systems remotely and it will also allow our support team to quickly dial in and take a look at your project in the event of any issues.

If a Hive player fails then our support team can open an SSH session to the device from a terminal window on one of your on site control laptops. Most issues can be tracked and fixed remotely through this approach.

Master control system

Many of our customers prefer to use a site wide master control system such as QSys or Streamdeck with companion. There are many options for this on the market now. At HIVE we consider ourselves to be an end point in a control system diagram, so we do not send messages out to control other systems. We prefer a master control system to control us. So to facilitate this we can receive messages via ArtNet, UDP or http, there are documents covering the command schemes for these protocols on the resources section of our discord page.

We would suggest that you program your master control system in advance of going to site and test the compatibility of your control commands with our system in advance. This will ensure that everything runs smoothly when you get to the commissioning phase.

Audio playback

It is possible to embed audio into video files on your Hive player and play out audio from the Hive players via the audio embedded in the HDMI output signal, or on the beeBlade/beeBox products there is a minijack audio output. However, most of our customers building large scale immersive environments use a dedicated stand alone multi track audio playback system, as they find this to be better suited to their high quality audio playback requirements.

We then ask the audio team to provide an LTC SMPTE timecode signal as one of their audio playback tracks, which we connect to a timecode interface which distributes the timecode over the ethernet.

Timecode synchronisation

Synchronisation to timecode is one of the core components of audio video playback on a large scale immersive environment project.

We advise customers to use the ‘TimeCore’ ethernet timecode interface.

We ask the audio team to provide an LTC SMPTE timecode signal as one of their audio playback tracks, which we connect to the TimeCore interface which distributes the timecode over the ethernet as ArtNet timecode.

The ArtNet timecode signal is read by the Hive players, a cue list is created and video files are played in precise synchronisation to the audio source. We recommend that you familiarise yourself with this in advance of your installation, to ensure that you are ready to set it up comfortably in a show situation.

Backups

Many of our customers find that they can run for many years without replacing their Hive players, even in 24:7 show conditions. However as these devices are little computers, one day they will fail, so the device will need to be replaced at some point. You may choose to carry some spare units so that you have them near by and ready to go quickly in the event of any failures.

1.3. Projection design

The exact placement of each projector within the venue should be determined in advance. During this process the optimum lens should also be selected for each projector. Consideration should also be given to power supply and any signal distribution that may be required. We call this process the projection design.

Your projection design should be done by an experienced projectionist who is able to plot the position of each projector in a 3D scene representing your venue, there are a number of good pieces of software for doing this now. No doubt your projection designer will have their preference.

Sometimes the projector supplier will also get involved in this process, in some countries Panasonic assist with this process, on other countries this task is usually undertaken by the systems integration team or AV supplier.

A thorough professional projection design is an absolutely essential part of a large scale immersive environment project. The Projection design becomes the basis of the technical plan that all other assets in the process will reference back to.

Consideration should be given to the resultant pixel size to ensure the expectations of your client. Adequate provision should also be made for blend areas (ideally around 10-15%. Another thing to watch out for is occlusions and shadows from other objects in your scene which should be avoided at all costs.

You will need to ensure projected outputs completely cover all of the surfaces, and allow for 10-15% overlap in blend areas.

You will need to ensure there are no occlusions or shadows in the projections and also in the mapping camera views.

1.4. Mapping camera design

The exact placement of each mapping camera within the venue should be determined in advance. During this process the optimum lens should also be selected for each mapping camera. Consideration should also be given to power supply and gigabit ethernet cabling.

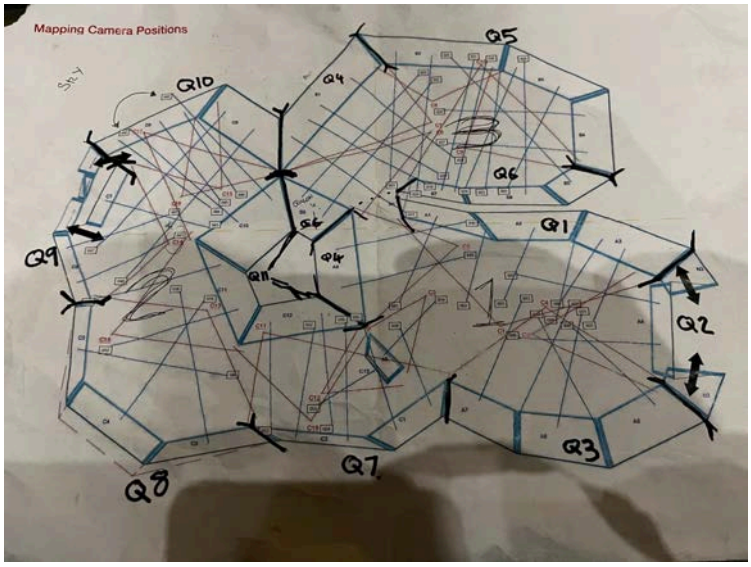
Your mapping camera design should ideally be done by your projection designer, there are a number of good pieces of software for doing this now. No doubt your projection designer will have their preference.

A thorough mapping camera design is an absolutely essential part of a large scale immersive environment project. The mapping camera design should integrate with the projection design with consideration given to avoiding shadows and obstructions in both the projected images and the camera views.

1.5. Asset preparation

Site diagram

Once you have a projection design, you will need to come up with a name/number convention with which all parties can refer to the projectors. Make this nice and logical so that everybody in your team can easily discuss the projectors



Interconnections diagrams

Once you have a site diagram then you should create a line drawing which shows how all the elements of the installation connect to each other. Be sure to label your signal types, and make sure that this document numbering scheme matches the site diagram numbering scheme.

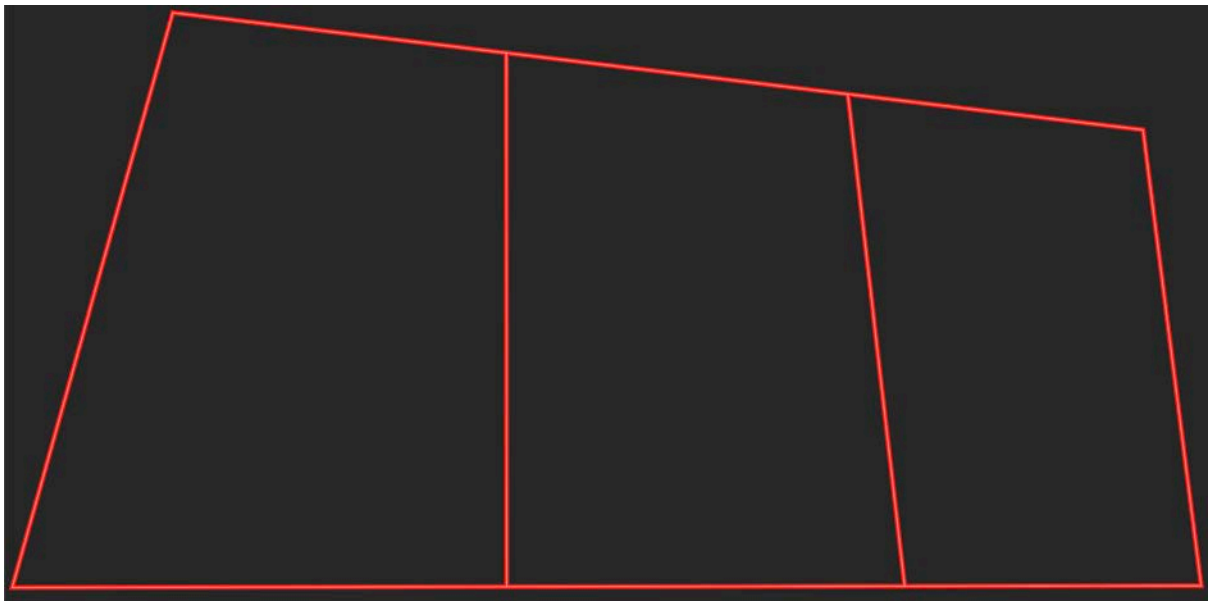
Content templates

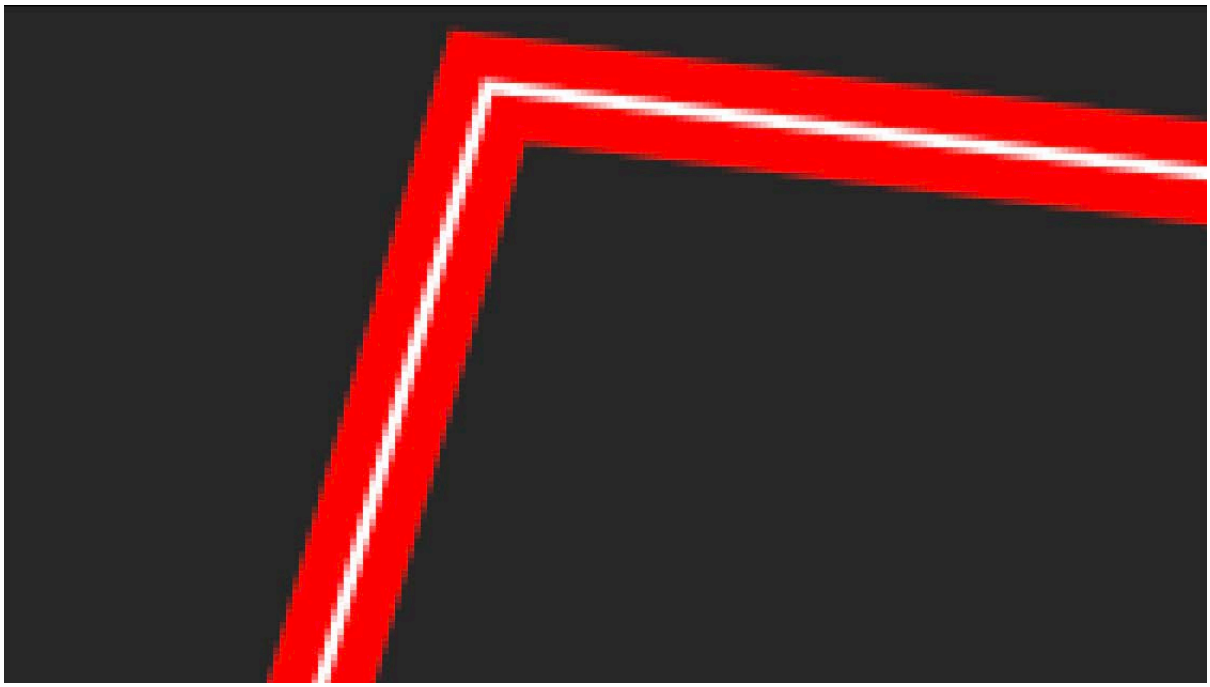
Good content templates can make the difference between a project that goes well and a project that fails. We would suggest that your content team looks something like this.

This template should be made in collaboration with the screen surface designer and / or your projection designer. The technical team should make the template and issue it to the content team. The content team should then use it a guide to place their content within. The dimensions also know as the resolution of this template should match the resolution that you wish the content to be delivered in.

If you zoom in you will notice that the lines look like this:

The white line in the centre of the line represents the exact position that the edges of the screen surface should be co incident with. The thicker red lines ensure that the edge of the screen can be seen from a distance once projected.





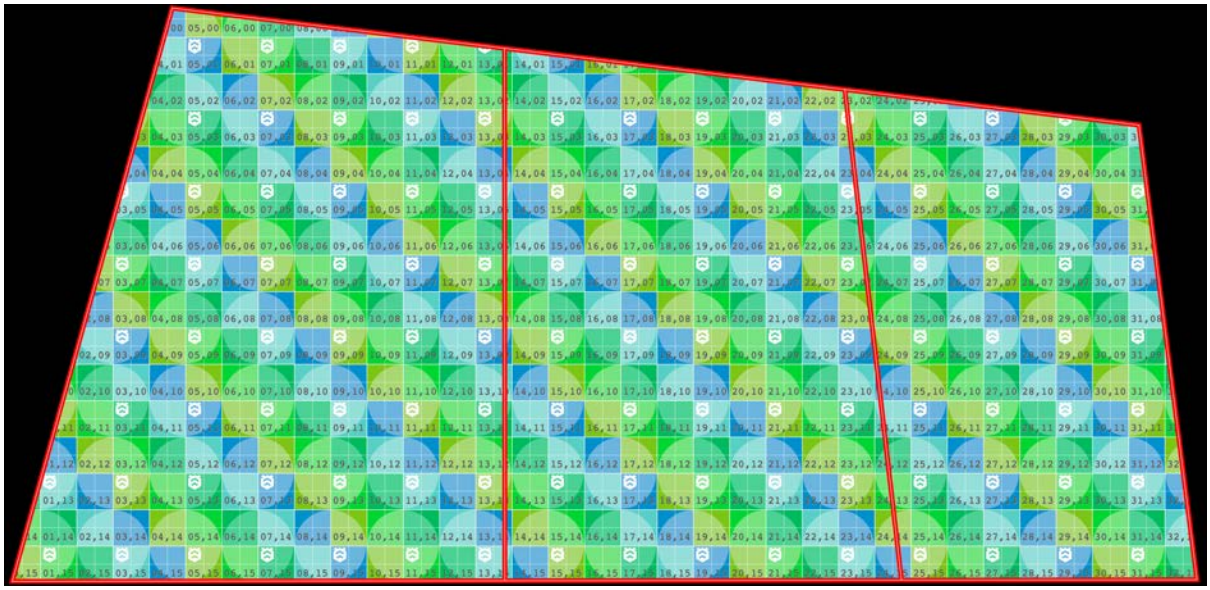
Making your content templates with an approach like this will make everything easier down the line.

It is essential that a content template like this is made for each and every surface in your project ready for the content creation team to follow. These templates should be created as soon as your projection design is complete, and at the beginning of the content creation process.

Line up templates

You will also need a different template for using whilst the mapping is being carried out on site. Please ensure these templates are created before you begin the on site installation. The care and attention you take to make these templates in advance will make the installation and mapping process so much easier on site. And once you get to site nobody has time to make the templates!

This template needs to look something like this:



Note the squares and the circles to ensure linearity. The numbers which will ensure you can refer to a specific area easily. And most importantly the content template red lines (with white centre) is overlaid on top for the precise alignment to be ensured.

The content templates and the line up templates should be created at a suitable resolution to ensure that the resolution of the projectors is used to their full potential, whilst also considering the practicality of creating content at that resolution.

The resolution of the template should match the resolution that you request content to be made at by the content creation team.

Media preparation

Resolution

One of the most important considerations is what resolution (dimensions) should Media be provided in. The content should be created at a suitable resolution to ensure that the resolution of the projectors is used to their full potential, whilst also considering the practicality of creating content at that resolution.

The Hive beeBlades have a hard limit of 8192 x 4320 at 60 fps for each beeBlade device. In a large scale immersive environment in many cases content is made at no more than 8k per wall or screen group, so this fits well with this limit. Making content at above 8k is a very time consuming process for the content creation team too.

Codec selection

To ensure smooth playback we recommend the following settings

Hive BeeBlade Preferred Codec Settings:
265 HEVC as mp4
Profile: Main
Level: 6.2
Tier: High
Bitrate Encoding: VBR, 1 pass
Target Bitrate [Mbps]: 100..800 (depending on quality requirements, 400 should be plenty in most cases)
Quality: Highest
Key Frame Distance: 1
Use Maximum Render Quality

We also recommend that the frame rate of your video files is either the same as the hive player output resolution, or at least a multiple of. So a video file made at 25 fps will look great on a 50hz projection. But a video file made at 29.97 fps will not look perfectly smooth on a 50hz projection.

File naming conventions

Please also use logical filenames to name your media files. For example:

MyFileFinalFinal_looksGood.mp4

Would be bad. Where as:

Screen12_SceneName_v03.mp4

Would be good.

Details like this make a project easier to manage on site. We suggest that a file naming convention should be set and agreed between the technical and creative teams before the media is rendered to avoid confusion on site.

Device settings list

So another very important file, is a list in a spreadsheet of all devices in the installation. This list should contain

Device names

IP addresses

Queen / Worker group settings

BeeSync setting

Adjust Settings - any special requirements for your project.

Trying to manage a project without this list will become very confusing very quickly. So it is another essential part of a successful installation.

2. Testing phase

2.1. Hardware compatibility testing

Before the on site installation begins we would strongly recommend that individual pieces of hardware which need to work together in your installation design are connected together. Just because a device says it is compatible with another product does not always mean that you will have a positive experience when you connect them together for the first time.

So in the weeks prior to your installation we suggest that you conduct some compatibility tests to ensure that your devices all play nicely together.

For example, please plug the Hive Media Player into your projector and check that you get an output as expected. Plug your mapping camera into the network switch you will use on site and test you can access it from the Screenberry mapping software from your control laptop. Try to ensure you do this with each individual piece of hardware on your project.

Doing this in advance ensures that any problems are solved before you go to site and the client is watching.

2.2. Full system test

Before the on site installation begins we would strongly recommend that all pieces of hardware in the project are connected together at least once and all major functionality is tested.

Sometimes problems only present themselves when everything is connected together and operated in show mode. A large scale immersive installation is a complex system with many components that should all ‘just work’ together, but the only way to be sure of this is to connect everything together before you head to site.

So in the weeks prior to your installation we suggest that you conduct some compatibility tests to ensure that your devices all play nicely together when they are running at the same time. Doing this in advance ensures that any problems are solved before you go to site and the client is watching.

2.3. Camera calibration practice

We would strongly recommend that you learn to use the Screenberry software well in advance of the installation of your project. Perhaps build a scale model and practice on there.

As a minimum we would encourage users to prepare their Screenberry project files for each of their projection surfaces well in advance of going to site, this will help to ensure that the mapping process goes smoothly on site. If you turn up on site hoping to do a complex video mapping project having not properly prepared, you will be likely to fail.

If you would like to find out more about the Screenberry software and how to use it to map complex surfaces with your Hive players please don’t hesitate to get in touch for more information at support@hive.run

3. Installation phase

3.1 Installation considerations

This guide is not intended to cover the details of the actual AV installation. Rather we are covering the process that users of the Hive Media Player should go through to prepare to create a large scale immersive environment system using the Hive Media Player.

There are a few things to highlight for consideration though:

Projector Colour balancing should be done by your projectionists before mapping begins. This is non negotiable. Adjust colour afterwards will compromise your blends. I re-iterate *Changing projector settings after the mapping has completed will affect the blends and so calibration will need to be run again.*

Your projector installation team will need to ensure projected outputs completely cover all of the surfaces, and allow for 10-15% overlap in blend areas.

Your projector installation team will need to ensure there are no occlusions or shadows in the projections and also in the mapping camera views.

Your projector installation team will need to check that all image transformations or keystone are removed from the projector.

There are a number of settings which should be set on your projectors before colour balancing & mapping commences, for Panasonic projectors these are as follows, for other models the settings will be similar and should also be set accordingly.

We recommend avoiding using Auto signal detection settings where possible. So in the DISPLAY OPTION -> SLOT IN menu, set the following manually:

- HDMI Signal Level FULL (not limited)
- Equalizer as needed, if you are seeing 49.99Hz maybe increasing the Equalizer a little might help with hitting the exact sync of 50hz

- Auto Gamma Select DISABLED (choose correct gamma in Picture menu)
- Auto Colour Space Select DISABLED (choose correct gamut in Picture menu)
- Dynamic contrast select DISABLED
- EDID Select 4K/60p/SDR
- EDID Mode USER and press Enter to go into the sub menu & select 3840x2400p resolution and then 50Hz as Vertical Scan frequency
- Finally, in the SIGNAL LIST menu, it might help to expand the signal lock in range to WIDE if the SDM board is outputting very slightly different refresh rates than the projector expects. It should mean 50p gets correctly registered as the signal type.

We insist that the projection team are in contact with the local representative of the projector manufacturer, so that if any issues are encountered with the projectors, an expert from the projector manufacturer can be contacted for support. The HIVE team are not able to advise on the exact configuration of your projection equipment.

4. Commissioning phase

4.1 Video Mapping

Once the AV installation has been completed you can begin the video mapping process.

First step will be to connect to the ethernet camera through the Screenberry software. You should have all of your project files preparead in advance.

The Screenberry software sends calibration patterns to the Hive players. The camera captures images of the calibration patterns as they are projected onto the surface by each projector.

The Screenberry software reads those images from the camera over the network, it the processes each image and works out how to blend the projectors together.

Once a projection canvas is determined which spans all of the projectors, the user can use bezier warp tools or 3d models to decide how their images should be placed on the projection canvas.

The calibration files are then exported from the Screenberry software, they are then imported into the Hive player, and the Hive player uses these calibration files to ensure that the video files and other media played on the Hive Player are aligned to the screen surface and blended across the projectors.

More information on this process can be found at

https://hive.run/support-tutorials

4.2 Media distribution

Media can be distributed to the Hive players in one of two ways:

- Through the Hive web browser user interface using our multicast media distribution system.

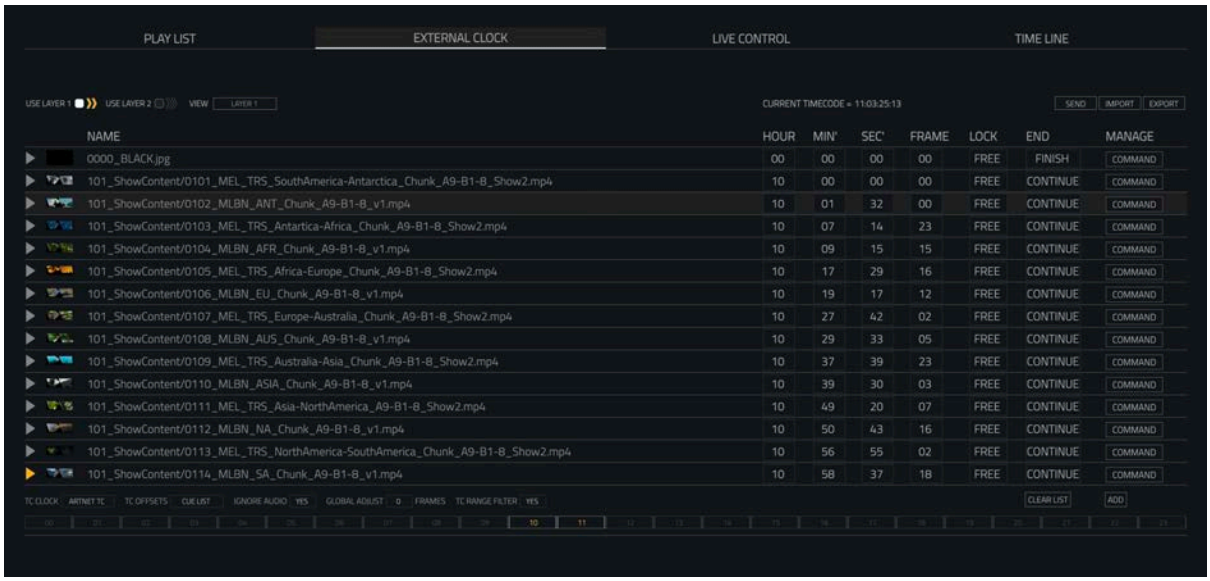
- Direct from the NAS if you have SSH access. We have a program we call beeKeeper which can synchronise files on the NAS directly to all hive players. We have tested this on a Synology NAS and it works well.

4.3 Show sequencing

In a timecode driven show the user will add media from their media list into the cue list on the Play/External clock page in the Hive software. In here the user can select the timecode that their media will trigger at.

Note if your show is broken into scenes and you wish for one scene to continue seamlessly on from the previous scene, select the ‘CONTINUE’ end mode, then when you add new movies they will be automatically added at a timecode which is equivalent to the previous timecode trigger plus the previous media files duration. This will ensure clean continuation from one movie to the next on your cue list.

We recommend using the TimeCore argent timecode device. To use this device the user simply selects the source as ArtNet TC.



The External Clock cue list in the Hive browser user interface.

4.4 Performance Optimisation

Here are a few settings to check in your Hive Media Players if the playback is not perfect.

Region Source

If you are only playing back a single layer of media and you are not applying effects or colour adjustments, then you should select your region source as ‘LAYER 1’ in the Advanced Mapping page. This will make a big difference to performance because the render pipeline is not setup in preparation to mix multiple layers as it is when you use the default region source mode ‘LAYER MIX’.

Disable device preview

When you login to a hive player the first thing you see is the device page. On this page there is a live preview which is a stream of jpg compressed frames illustrating what your hive player is rendering out onto your HDMI output. Creating this stream uses system resources on your Hive player, so if you want to achieve optimum performance, disabling this preview will help significantly.

Display Device Setting

Many display devices such as projectors and displays have manufacturer settings which can affect performance. For example on Samsung TV’s best performance can be achieved in ‘Game’ mode as it reduces latency and improves display mode capabilities. Manufacturers often use default settings which are sub optimal for our use case because it allows them to create a ‘better’ picture or use less power in a consumer use scenario. Other examples of this are ‘dynamic contrast’ on Panasonic projectors, 'motion smoothing’ on Sony displays and so on. For optimal performance please read the manufacturers manual for your display product and disable any mode which is trying to ‘improve’ the image, and enable any mode which mentions reducing / improving latency.

Clock Correction

In the Adjust / Settings page you will find a setting called clock correction. If your system is not at full capacity and you believe it should be capable of playing your media smoothly, but you see occasional stutters, then you could enable clock correction, this attempts to ensure that each frame is presented sequentially, if any frame numbers are

repeated or skipped then they will be corrected. Please note that if the system is at capacity and dropping frames due to not being able to render the frames in time then this setting will not help, it may make performance worse in this situation.

Timecode Smoothing

On the Play / Timecode page you will get best performance from selecting ‘smooth’ as the sync mode. You may also want to try enabling ‘glitch protection’ this will smooth out any incoming network related gaps in the timecode packets the system receives

Output frame rate vs content frame rate

For optimal performance it is recommended that the frame rate of your video files is either the same as the hive player output resolution, or at least a multiple of. So a video file made at 25 FPS will look OK on a 50hz projection. But a video file made at 29.97 FPS will not look perfectly smooth on a 50hz projection. For optimum smoothness you should consider rendering your content at 50 or 60 FPS.

Codec selection

To ensure smooth playback we recommend the following settings

Hive BeeBlade Preferred Codec Settings:
265 HEVC as mp4
Profile: Main
Level: 6.2
Tier: High
Bitrate Encoding: VBR, 1 pass
Target Bitrate [Mbps]: 100..800 (depending on quality requirements, 400 should be plenty in most cases, but 800 may be required where optimum quality is critical)
Quality: Highest
Key Frame Distance: 1
Use Maximum Render Quality