Content Production Guidelines
for Christie® MicroTiles®
3 Storeys to Tell Your Story
## TABLE OF CONTENTS

- STARTING YOUR CONTENT DESIGN PLAN ................................................................. 3
- PLANNING THE CONTENT .................................................................................. 4
- VIDEO CONTENT AND PRODUCTION REQUIREMENTS ........................................... 4
- PLANNING THE COLOUR .................................................................................. 5
- DETERMINING THE RESOLUTION ...................................................................... 5
- CREATING AND CHOOSING SOURCE MATERIAL ..................................................... 6
- ENSURING SATISFACTION .................................................................................. 7
- PLANNING THE TECHNICAL SYSTEMS ................................................................. 7
- PLAYBACK SOFTWARE ....................................................................................... 8
- MEDIA PLAYERS, GRAPHICS CARDS AND RESOLUTION ...................................... 8
- CHRISTIE MICROTILES ECU ............................................................................. 8
- COMPRESSION TECHNOLOGY ............................................................................ 9
- MANAGING GRADIENTS AND POSTERIZATION ................................................. 10
- UPSCALING ..................................................................................................... 11
- GLOSSARY ....................................................................................................... 12
STARTING YOUR CONTENT DESIGN PLAN

WHERE TO BEGIN?
When creating a display for the University of Waterloo Stratford Campus Christie MicroTiles® video wall, you will use the same creative design software tools, and follow the same processes for planning, design, animation, video integration and final rendering as with any digital media display.

Similarly, when starting this type of digital media project you will need to understand the dependencies that the people and technology have on each other. The collaboration between the creative and technical people is key to the success of the project, followed by the technology and technical/logistical details.

If possible, the team should meet onsite¹ at the University of Waterloo Stratford Campus to see the Christie MicroTiles wall in the lobby (30 MicroTiles high × 5 MicroTiles wide) as it will help with understanding the physical surroundings and the conditions that affect the display, such as

- natural light (the display is beside a 30’h ×60’w window),
- sightlines and distances from which people will typically encounter the display,
- dynamics surrounding the display (whether people will be moving past quickly or slowly, or will stand to watch the display).

The following steps will help start the project planning documents:
1. Create your team. Engage the creative and technical minds from the beginning of the project.
2. Validate and align the business and communication objectives of the project to maximize the display capabilities.
3. Define the appropriate content model strategy and how to use the display surface to its full potential.
4. Working with a technical project manager, establish media player requirements to produce the desired quality of signal output and how to possibly maximize your display. Along with the high resolution of the display are additional tools configured into the wall included a Vista Spyder X20 video processor and Christie JumpStart (content management solution) to manage and distribute your content throughout the display.
5. Select playback software.
6. Develop a content grid that will help structure and tune content within the wall. See Figure 1. to review possibilities for your content grid.
7. Start designing.
If a content creator/team is unable to visit the site in person, please notify the University of Waterloo Stratford Campus technical team. Arrangements will be made to virtually view the wall using a real-time camera system.

PLANNING THE CONTENT

The content that you design will work best if it provides value for the viewing audience and synchronizes business and communication opportunities for you and/or your team and other stakeholders for the project.

Your display should have a well-defined strategy and visual structure. It needs to be more than REALLY big, breath-taking visuals. Consider the following as you start planning your display.

• What are you trying to communicate in your display? Who is the end audience for your content? A potential client?
• Is the content in context for the viewer? Does your message shine through the design so that the viewer sees it and understands? Or is the message blended into a larger design component on the wall?
• Will it stop viewers in their tracks?
• Will it add aesthetic value to an environment?
• Will it provoke the emotion or response that is aligned with your project plan?

DESIGNING THE CONTENT

Designing content for Christie MicroTiles is similar to designing content for websites and interactive displays (e.g., designers consider the way our eyes travel around a screen when placing content). Organizing the content flow across the display is made relatively easy by the grids (see Figure 1.) that are created when the tiles are stacked and arranged. Use the grid plan to determine where the content will be positioned and how it arrives, moves around and leaves the display’s viewable area. Working with a grid will enable you to manage how the content will show on a single screen, and how the (small) seams between tiles can disappear or be accentuated by improper elements and font placement.

VIDEO CONTENT AND PRODUCTION REQUIREMENTS

Video content is traditionally measured in a broadcast format such as HD and SD. However, the University of Waterloo Stratford Campus display is a custom canvas because of its height.

RENDERING THE CONTENT AND SOFTWARE TOOLS

Any application that is used for motion graphics can be used to create a Christie MicroTiles display. The success of the display depends on using

• optimal video formats,
• encoded presets and resolutions to ensure optimal image and playback quality,
• studio workstations with the CPU power, memory and suitable storage capabilities to efficiently produce the highest-quality files,
• media playback equipment that is equipped to drive a superior signal to the display,
• video files that are converted to the h.264* video codec and output as MP4 files (this format produces the best blend of quality images and manageable file sizes), and
• recommended software when creating irregular aspect ratios for non-live designs (e.g., Adobe After Effects or comparable video compositing software).
• Other formats work, but h.264 is the most efficient and is compatible with onsite media playback software.

PLANNING THE COLOUR

The LED light engine technology within each Christie MicroTile unit produces 115% of the NTSC or PAL video colour spectrum. This means that viewers can see a range of colours that are not possible on other display technologies. Keep the following in mind as you design your content:

1. The colours that look best on Christie MicroTiles are deep, saturated reds, greens and many blues, as well as blends of these colours.
2. Blacks* output a rich, deep colour level that is difficult to obtain with other display technologies.
3. Mid-tone colours look better on Christie MicroTiles than on other display technologies, but saturated colours will look best.
4. Whites and weak colours produce less than optimal results and are not recommended except in minimal instances.

*Integrating black areas in the design creates visual depth and optimizes the impact of the contrast with the saturated colours.

DETERMINING THE RESOLUTION

The optimal resolution for any Christie MicroTiles display is a function of the ability of the viewer to see individual pixels, which is affected by a person's distance from the screen and visual acuity. For example, when someone with 20/20 vision stands 8 m (26 ft) away from a display, they cannot see individual pixels smaller than 1 mm. Therefore, the resolution of the original source material must ensure that someone standing close to the display cannot see the individual pixels in the content.

The native resolution of a single Christie MicroTile is 720px × 540px. The combined native resolution of the entire University of Waterloo Stratford Campus Christie MicroTile wall is 3600px × 16,200px. This is achieved by adding all pixels in the 30h × 5w array.

The highest overall practical resolution that the wall is capable of displaying based on the current backend technology is 1600px × 7200px. It is recommended that content be created with this highest practical resolution in mind if the design in question takes advantage of any portion of the surface area provided throughout the as a continuous pixel canvas. Surface area an aspect ratio of 2:9 when treated as a single canvas.
Suggestions

- Create content and assets for the maximum resolution possible throughout your production workflow so that files are easy to adjust and compress (as needed) without perceivable loss of quality and so that you have a source archive that can be re-used.

- Upscaling content from lower resolutions can introduce compromises that may be acceptable in some projects, but not in others. Consider using vector art for many graphics prior to final rendering.

- For greater control of the wall (maximizing overall resolution) include the Vista Spyder X20 in your setup. The Vista Spyder X20 can also be used to output different resolutions and/or formats so your display will look its best in all zones. Prior experience with Vista Spyder X20 hardware is required if taking advantage of this equipment.

The following table provides general guidelines, but also a comparison to other Christie MicroTile installations.

<table>
<thead>
<tr>
<th>Viewing distance</th>
<th>No Visible Pixellation</th>
<th>Minimal Visible Pixellation (33% increase)</th>
<th>Pixellation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Feet</td>
<td>Meter</td>
<td>Displayed pixel pitch (mm)</td>
<td>Displayed pixel pitch (mm)</td>
</tr>
<tr>
<td>&lt;4</td>
<td>&lt;1.2</td>
<td>0.567</td>
<td>0.690</td>
</tr>
<tr>
<td>5</td>
<td>1.5</td>
<td>0.618</td>
<td>0.873</td>
</tr>
<tr>
<td>6</td>
<td>1.8</td>
<td>0.750</td>
<td>0.980</td>
</tr>
<tr>
<td>7</td>
<td>1.2</td>
<td>0.873</td>
<td>1.160</td>
</tr>
<tr>
<td>7-10</td>
<td>1.2-3</td>
<td>0.873-1.196</td>
<td>1.160-1.620</td>
</tr>
<tr>
<td>10-15</td>
<td>3-4.5</td>
<td>1.196-1.81</td>
<td>1.620-2.48</td>
</tr>
<tr>
<td>&gt;15</td>
<td>&gt;4.5</td>
<td>&gt;1.81</td>
<td>&gt;2.48</td>
</tr>
</tbody>
</table>

NOTE: Pixel pitch values are for reference only.

CREATING AND CHOOSING SOURCE MATERIAL

Image imperfections or low-res images in the content can go unnoticed with some display formats. This is not the case with Christie MicroTiles. If the original material provided is of poor quality, the finished content will be sub-standard as well.

For all Christie MicroTiles displays, it is extremely important to use high-resolution source material, or an adapted resolution to scale the images or video.
ENSURING SATISFACTION

The final display relies heavily on the quality of the content and the message within. As you plan and execute your project, remember to

- use source material that is the highest quality and resolution;
- ensure the software and hardware meet all your requirements to produce the content and play it back flawlessly (do not cut corners);
- plan how each element of the display is positioned, arrives, builds on existing element of your content and leaves the canvas; and
- understand your audience. Audiences can be transient and have short attention spans; ensure your display not only is high quality and relevant to this audience, but has the power to stop them in their tracks.

PLANNING THE TECHNICAL SYSTEMS

There is more to your project than content. There are underlying technologies, technical/logistical considerations and processes that ensure the files are designed, rendered, compressed, programmed and played out the way that you have planned.

Before producing content, identify output resolution, media player and playback software. For your display at the University of Waterloo Stratford Campus, you can expect the following:

- Output resolution: 1600 × 7200 px file templates with the correct dimensions can be made available to you and/or your team if requested for a variety of design software titles.
- Aspect ratio: 2:9 overall.
- SDI connection: one is available for external windowed sources on the wall such as live cameras facilitated by the Vista Spyder X20.
- Media players / Playback software: high-end Windows 7 servers with VLC, QuickTime, Windows Media Player, Pandora’s Box, and Christie JumpStart installed.
- Live-feed video: allows the designs to be viewed, reviewed and approved remotely; you will be given a video of content for distribution and promotion; content may be archived by University of Waterloo Stratford Campus for future promotional use.
- Vista Spyder X20 video processor: A template file for the Vista Spyder X20 control interface, Vista Advanced, can be provided if necessary.
- Rendering farm equipment: We may be able to support the file rendering process, depending on the project.

Suggestions

- Build time into your project schedule to test your display onsite. The technical team may need to ensure the operating system, various software apps, drivers and graphics cards are working properly.
- Pay attention to things like
  - stability and the absence of glitches,
  - the fluidity of the video playback,
• demands on processing power, and
• proper formatting of file types and file dimensions.

PLAYBACK SOFTWARE

There are several software applications—most of them labeled as digital signage software—that can do the work of organizing, scheduling and driving high-quality signals to a Christie MicroTiles display. Some applications are elemental, while others can be more sophisticated than what is needed for your project. For your display, you want to ensure the software supports your content plans.

The following companies offer applications that are compatible with Christie MicroTiles and ECUs: C-nario, CoolSign, Float 4 Interactive, Harris, Omnivex, Remote Media, Scala and WireSpring.

Many other companies also offer effective playback solutions. You may even consider very simple playback engines like VLC and the video capabilities of iTunes or Apple’s Quicktime, depending on your content requirements.

MEDIA PLAYERS, GRAPHICS CARDS AND RESOLUTION

Large MicroTiles walls, such as the one at the University of Waterloo Stratford Campus, require powerful CPUs and graphics cards. Our equipment includes the following.

• Media players: There are two preconfigured rack-mounted Windows 7 64-bit servers, also known as Christie JumpStart Servers. These media servers, based on HPZ820 workstations, feature Intel Xeon processors in a 16-core configuration, with 2GB video cards to push content to the inputs of the wall. These servers run Christie Jumpstart and Video LAN player software. Each server utilizes 32GB of system RAM.

• Graphics cards: These cards (AMD FirePro W600) take over much of the video playback from a computer’s CPU and are recommended for many Christie MicroTiles projects.

• Driver support: Support for uncommon resolutions can be challenging. We use the Vista Spyder X20 in tandem with an Extron video router to achieve the resolutions needed for the display of such large pixel dimensions.

CHRISTIE MICROTILES ECU

The External Control Unit (ECU), required for each Christie MicroTiles display, delivers content to the tiles while providing system level control, auto-calibration and monitoring of the full display. The ECU is compatible with all standard graphic formats, playback devices and mainstream creative and digital signage software.

VISTA SPYDER X20 and Vista Advance Software Interface
The 30h × 5w Christie MicroTiles display wall is integrated with a Vista Spyder X20 live video processor.

The Spyder X20 video processor in your wall set-up provides

- a 20-megapixel bandwidth that enables you to
  - blend, window, mix and scale any source format and then route the
    signal to the Christie MicroTiles (you can display stills, overlays, video and
    live-feed content at the same time),
  - achieve greater brightness, superior image quality and resolution, and
  - achieve smooth transitions (nothing jagged);
- integrated source monitoring for simultaneous, real-time, full-frame rate
  monitoring of all inputs;
- universal input/output capabilities _(mix and match multiple formats with one
  piece of equipment);_
- built-in conversion between digital and analogue, progressive and interlaced,
  and disparate resolution video formats;
- output blending and rotation;
- built-in still store functionality;
- intuitive user interface with drag-and-drop programming;
- online editing mode that allows for making changes on the fly, as well as preset
  displays to be built in advance and/or edited in preview mode without affecting
  what the audience is seeing;
- the ability to schedule the display according to the time of day; and
- the ability to save your final set-up as a single command key preset.

Christie JumpStart is a content management system that is packaged with the JumpStart media server. It lets you display multiple, high-bandwidth video files, graphics, Microsoft Windows applications, Blu-ray™ and DVD movies, colour swatches and text on a 5–10 megapixel digital canvas. This system can enhance your presentation.

Suggestions

- JumpStart is capable of higher than HD resolution playback using multiple
  outputs.
- JumpStart provides you with a solution to play back content on a timeline.
  However, scheduling by date is not supported.
- Using the JumpStart system as one of the inputs for the Vista Spyder X20, along
  with any other video source, enables you to layer anywhere and in any size on
  the wall.

**COMPRESSION TECHNOLOGY**

It is strongly recommended that final video content files be converted to MP4 format, using h.264 compression. Testing has shown that h.264 provides the optimal solution for high-quality video files, flexibility in resolution and completed sizes that were manageable for playback, transfer and storage.
There are numerous video compression software applications that provide satisfactory results for encoding completed full-motion creative designs. At the University of Waterloo Stratford Campus your files may be compressed further using Adobe After Effects, Adobe Media Encoder and/or Handbrake. Other suitable applications include: Sorenson Squeeze, Autodesk Cleaner, Compressor, MainConcept Reference, Episode Pro and QuickTime.

![Output Module Settings](image)

Figure 2. Example of the render and compression settings typically used for creating full MicroTile wall compositions that will later be upscaled back from 1024 × 4608 px to 1600 × 7200 px.

Bit rate selection is a variable that depends on either the hardware set-up of the playback device (such as CPU power, RAM and graphics cards) or the technical approach for the content. Please keep this in mind when compressing content. You may wish to make several versions at different levels of bit rate compression.

**MANAGING GRADIENTS AND POSTERIZATION**

The encoding techniques that make file sizes manageable can also create colour-band issues that can be a challenge when managing the gradients within a display.
Colour banding is accentuated on MicroTiles because the visuals are so crisp and colours so vibrant. To minimize posterization, it is recommended to introduce noise (dither) in the files. By increasing the number of bits per colour channel, it also tends to limit posterization.

UPSCALING

Upscaling creative reduces file size and possibly the burden on the playback hardware and software. While excessive upscaling should be avoided, for displays where viewers will view tiles no closer than 2 or 3 m (6–9 ft) away, upscaling by as much as 50% will still produce very pleasing results.

In fact, image data sent to the wall is automatically scaled down to 1024 × 4608 px from 1600 × 7200 px by the JumpStart media servers before it is upscaled again by the Vista Spyder X20. You may wish to consider using these canvas dimensions towards the end of your rendering workflow to avoid unnecessarily large file sizes and save some time during the final rendering of output.

In instances where upscaling is utilized, content should continue to follow an aspect ratio of 2:9. This will prevent distortion of heights and widths.

When viewers will be in close proximity to the display wall, consider limiting or entirely avoiding upscaling to get optimal visual results and audience impact. If fonts will be subject to upscaling, ensure the text already uses large, thick font sizes.

By including the Vista Spyder X20 in your set-up, multiple content sources can be combined to generate an enhanced resolution that will exceed what any single display can support. Prior experience with the Vista Spyder platform, Vista Advance, may give you enhanced capabilities.

Technical Requirements

To create video content for either the full wall, the lower third of the wall or both, you will require an application that enables you to create custom sized canvases such as Adobe After Effects, Flash, 3DS Studio Max, Apple’s Motion, etc.

For content displayed in Zones E and F of the 30h × 5w wall, it is recommended that you use a computer with an Intel Xeon Processor in an 8-core or higher configuration. This will ensure that a shorter timeframe is needed to render the content (depending on the complexity of your design).

Minimum PC Requirements

The content media servers (PCs) are Intel Xeon processors in a 16-core configuration, with 2GB video cards to push the outputs to the wall, run Christie Jumpstart and Video LAN player software and have 32GB of RAM. Consider using a machine with similar specs for content creation and testing.
Codec Requirements
Content designed in a standard orientation, that is placed and scaled can be rendered using MP4 encoding with 100% special quality.

Audio requirements
The 30h ×5w Christie MicroTile wall in the main lobby has two stereo line base speakers.

To include audio with your display do the following:
1. Include the requirement as part of the application process with the PreApproval Form.
2. Provide the audio file with your video content file so that both files can be rendered together or simply include the audio as a part of the video file. Audio should be rendered with 48Khz bit rate (uncompressed). Any raw audio file submissions (separate from the video) need to be sent in WAV, FLAC, or MP3 format with further instruction about its context in the overall design.

Please Refer to the Policies and Procedures for Christie MicroTiles Document.

GLOSSARY
Bit rate: the number of bits that are processed per unit of time.

Vista Spyder X20: video processor with a 20-megapixel bandwidth that enables you to manage the content of your display. It accepts inputs in any format and resolution and can output any format and resolution. The model at the Waterloo Stratford Campus is a Spyder X20-1608, which means it has 16 inputs and 8 outputs.

Christie JumpStart: content management system packaged with a media server. JumpStart automatically recognizes the MicroTiles and optimizes the resolution of the display, no matter the shape.

DLP: Digital Light Processing (DLP) is projector technology that uses a digital micro mirror device. The technology is developed and owned by Texas Instruments. DLP is used in a variety of display applications from traditional static displays to interactive displays and also non-traditional embedded applications including medical, security, and industrial uses. DLP technology is light-source agnostic and, as such, can be used effectively with a variety of light sources. Historically, the main light source used on DLP display systems has been replaceable high-pressure mercury-vapour or Xenon gas lamps, but in many newer DLP projectors high-power LEDs or lasers are used as a source of illumination.
**External Control Unit (ECU):** required for each MicroTiles display, delivers content to the tiles while providing system level control, auto-calibration and monitoring of the full display. Six tiles per ECU can support native resolution.

**h.264/MP4 Part 10 compression:** is a standard for video compression and is currently one of the most commonly used formats for the recording, compression, and distribution of high-definition video. It is one of the codec standards for Blu-ray discs and is also widely used by streaming Internet sources.

**HD resolution:** native resolution is 1920 × 1080 px, aspect ratio 16:9

**Hybrid resolution:** can mean a non-standard resolution or that not all outputs need to be the same format and resolution.

**LED:** A light-emitting diode (LED) is a semiconductor light source. LEDs offer (compared to incandescent light sources) lower energy consumption, longer lifetime, improved physical robustness, smaller size, and faster digital switching.

**MP4 format:** a common multimedia format used for saving movies and other video files. It is compatible with both Macintosh and Windows platforms. The format specifies a multimedia container file that contains one or more tracks, each of which stores a particular type of data: audio, video, effects, or text.

**NTSC and PAL video systems:** are the two television display systems in commercial use: NTSC (US and Canada) delivers a frame rate of 30 fps using 525 lines, while PAL (common in Europe and parts of Asia) delivers a frame rate of 25 fps (frames per second) with 625 lines. The colour information of the signal is encoded differently between the two systems. MicroTiles are compatible with both systems and can show a wider range of colours than other digital display systems.

**Posterization:** is the conversion of a continuous gradation of tone to several regions of fewer tones, with abrupt changes from one tone to another. The effect may be created deliberately, or happen accidentally. Unwanted posterization (or banding) may occur when the colour depth is insufficient to accurately sample a continuous gradation of colour tone. As a result, a continuous gradient appears as a series of discrete steps or bands of colour.

**SD resolution:** a digital video signal that has a resolution of 720 × 480 px, aspect ratio 4:3 or 16:9. Only the centre 704 px contain the actual 4:3 or 16:9 image, and the 8-pixel wide stripes from either side are called nominal analogue blanking and should be discarded before displaying the image. Nominal analogue blanking should not be confused with overscan, as overscan areas are part of the actual 4:3 or 16:9 image.

**Upscaling:** Converting a video signal from a low resolution (i.e., standard definition) to a higher resolution (i.e., high definition).
The 3 Storeys to Tell Your Story program was made possible by funding from: