



**ROE Visual LED Products for  
Virtual Production for  
Film & Broadcast**



Faber Audiovisuals - Giro 555. Nathan Reinds



## ROE Visual LED Products for Virtual Production for Film & Broadcast

A silent revolution is taking place on film and TV sets, virtual production is enabling productions to create immersive and dynamic sets and backgrounds, based on simple LED panels instead of elaborate and costly set designs.

LED panels prove to be the ideal solution and canvas to portray set and backgrounds created in virtual reality. Thereby creating maximum flexibility for the production teams to make last-minute set changes or slight alterations and comforting actors in a setting that is both real and immersive, enhancing their performance in comparison to performing against a green screen.

### Kenneth Branagh

*“When using a live LED wall in place of a static green screen, you as a director gain additional benefits such as increased accuracy and control over framing and lighting. Your actors will know what they’re looking at and be able to modulate their performances to match the action instead of suffering from green-screen fatigue and disorientation.”*



Big picture - xR Studio

## How does this work?

By building a massive LED video wall, you can create dynamic digital sets that replace the traditional greenscreens. Adding a LED ceiling or LED floor you can even further enhance the dynamic digital environment. Making it as immersive as you want.

LED ceilings also provide a responsive and stable light source for your set, offering an alternative towards regular TV and film lights.

## Created by partnership

This revolution started when **Epic Games** partnered with **Lux Machina**, **Magnopus**, **Profile Studios**, **Quixel**, **ARRI**, and **DP Matt Workman** to try out the capabilities of the latest virtual production toolset in Unreal Engine 4.23 for this specific application.

When the right people, tools and materials come together, you can create thrilling and innovative filmmaking. See how it all comes together in this video.

<https://youtu.be/Hjb-AqMD-a4>

### Wes Ball

*“If the production involves a real-time LED wall, as a DP you’ll find plenty of new options for control over the image. Turnaround becomes far less time-consuming and you can hold and control the time of day to any specific mood and color temperature you desire.”*

## Using the right tools

Creating the right canvas for this type of application is not just building any LED screen.

It's where the LED panel, processing and camera work together, complement and strengthen each other that real stunning results are achieved.

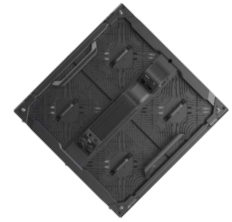
The pixels on the LED wall are driven in real-time by the game engine, this requires sufficient driver IC to do a proper job.

Using the right tools also means you need to select the right type of LED panel for the specific application you have in mind. There are slight differences in using LED panels for a virtual event, e.g. broadcasting a live audience, or for film content that uses close-up shots.

It's good to discuss your needs and demands upfront with a specialist, so the right type of LED panel for the application can be advised.



Black Pearl BP2.8



Diamond DM2.6



Sapphire SP1.5



Black Marble BM4



Ruby RB2.3



Carbon

and premium parts makes this work. Scan rate and color performance are important for the on-camera performance, ROE Visual have tested this extensively and now know that most important is the close collaboration with the partners involved, like for processing and camera. So much information and data has been shared to come to the current results and we even hope to be able to optimize this in the future. The Ruby LED panel has also been part of these tests, making it possible to test with smaller pixel pitch as well".

## Striking results with ROE Visual

So why do the ROE Visual panels have such an outstanding performance in this setting?

Intensive testing and tweaking tell us, this is not down to one factor, but a combination of factors. Certain is that the combination of the LED screen and the processing and syncing of these with the camera, is crucial to get good results. This needs to be done for every setup.

ROE Visual LED screens work with high-end components, and state of the art driver IC's, which makes all the difference for the on-camera performance.

Most ROE Visual LED panels are capable to display visual in either 10-bit or 12-bit HDR. By selecting the premium LED batches from carefully selected suppliers, ROE Visual is able to reach more than 90% of the color gamut on a rec2020 target. And last but not least for this type of application, ROE Visual LED panels are able to work with higher frame rates. Due to new high frame-rate options in the software, ROE Visual LED panels can reach up to 144 frames per second.

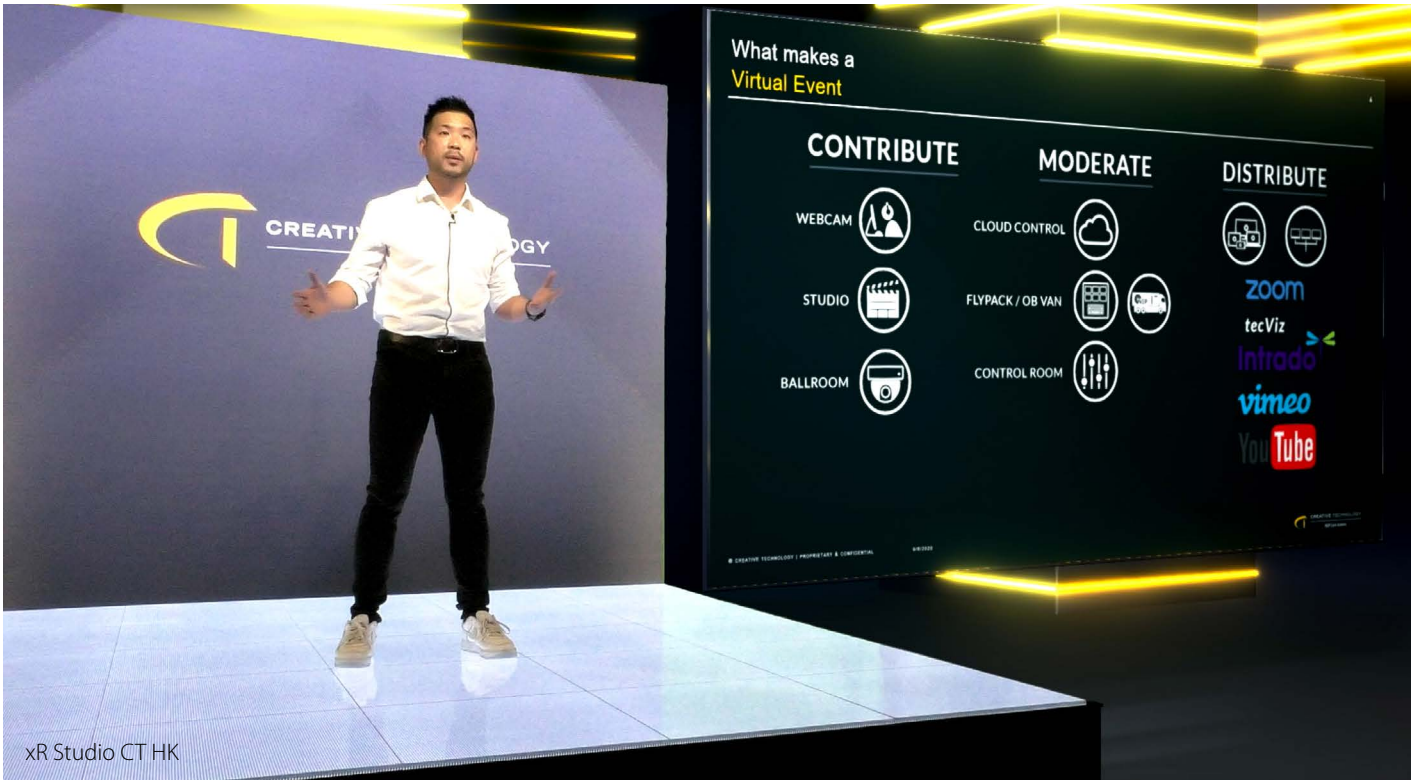
"ROE Visual has various reliable and stable LED panels", comments Roelof Bouwman, Managing Director, "they just don't fail, but also the combination of high-end manufacturing

"All our leanings and the feedback from our partners can now be translated into perfecting the product specifications when using this new and innovative technology", states Frank Montero, Managing Director, "Together with our partner Fuse, we were able to really see the requirements of this type of production. During the Mandalorian shoots, feedback from all partners involved was vital to bring the production to such heights, like being involved in a learning process with a very steep curve. It was a great experience working together with such a committed team".

See how it was done here: <https://youtu.be/gUnxzVOs3rk>

### Bill Poe

"LED walls do present some photographic challenges as with any technology, which you'll want to take into consideration. Carefully coordinate with the team sourcing the LED panels to ensure a sufficient pixel pitch to avoid potential moiré issues. The color science and bit-depth of the on-screen image should also be accounted for. You'll want to confirm that the color balance and possible LUT applied to the screen complement the settings of your camera and supporting equipment. Also if you are using the LED wall to extend a foreground set, careful color balancing to achieve the smoothest blend is required."



## Outlook to the future

Based on the experience gained during the latest projects and input from all partners involved, ROE Visual will be able to continue to improve and develop LED panels for this type of use.

Working closely together with all involved technical partners, ROE Visual is in the perfect position to continue to support this technique, applying learnings from the work floor directly into the LED products.

More info:

<https://www.unrealengine.com/en-US/programs/virtual-production>

[https://www.ibc.org/trends/vfx-making-the-unreal-into-a-reality/6111.article?utm\\_source=Adestra&utm\\_medium=email&utm\\_term=&utm\\_content=Read%20more&utm\\_campaign=IBC365%20E-bulletin%2019062020&project\\_ID=445](https://www.ibc.org/trends/vfx-making-the-unreal-into-a-reality/6111.article?utm_source=Adestra&utm_medium=email&utm_term=&utm_content=Read%20more&utm_campaign=IBC365%20E-bulletin%2019062020&project_ID=445)

### Guy Norris

*“ Scenes featuring real-time LED walls add another new dimension to your toolbox. You can create live stunt sequences that look incredible but are no more dangerous than walking in front of a movie screen. Careful integration between the foreground set and its extension into the LED wall can create highly believable sequences. ”*

## Terminology:

### Nit

A measurement of how much light a display screen sends to your eyes within a given area.

### Refresh rate

The frequency with which an electronic display is refreshed, usually expressed in hertz (Hz). Higher refresh rates can make motion appear smoother.

### Smart Stage

A stage purpose-built for virtual production including LED walls, tracking systems, and real-time capabilities.

### Virtual lighting

Use of an LED screen to directly light a scene or act as interactive/reflective lighting.

### Live LED Wall for film and tv sets

A live LED wall for complex visual effects scenes, in lieu of more traditional green screen, also provides a number of benefits to you as the producer. By creating an entire scene live on an LED screen, visible both through the camera and to the actors on set, your team entirely avoids "green-screen fatigue." This can occur when the cast and crew become inured to looking at the same flat-color screen for long periods and creatively disengage from the story. Instead, a live LED wall gives everyone a clear visual context, keeping them as engaged as they would be on a location shoot.

### Live LED Wall In-Camera Virtual Production

The use of image output from real-time engines to a live LED wall in combination with camera tracking to produce final-pixel imagery, completely in camera, represents the state of the art for virtual production.

The benefits of live imagery projected behind the actors are massive. In some respects, it's also the culmination of all of the previous development work done in the sphere of virtual production.

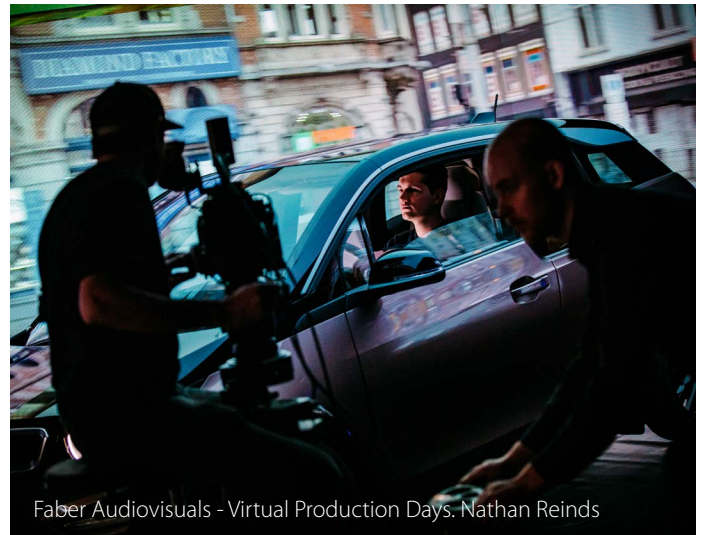
Compared to green screen cinematography, there is no uncertainty for cast or crew. Everyone can see exactly what is in the shot as it unfolds in real-time. The camera operator can frame as they would any real object and the actors can react not to a marker representing an imaginary image, but the actual final imagery live in front of them.

All of the natural reflections and lighting from the screen provide important artistic cues and enhance the realism of the imagery, compared to the typical struggle to avoid contamination from the green screen's color spilling onto the subject as well as creating unwanted reflections.

A precursor to live LED projection via real-time engines is the projection of pre-rendered or live-action footage. This technique achieves a high level of image quality and immersion, with the only exception being that the perspective is fixed and does not shift in relation to the camera's movement. Thus, it is still limiting in terms of shot design and blocking, and is generally best suited to objects that are some distance from the foreground action in order to help minimize the lack of parallax. Some recent projects which have leveraged pre-rendered projection for in-camera effects include *Oblivion*, *Murder on the Orient Express*, *Solo: A Star Wars Story*, and *First Man*.

The quantum leap of using a real-time engine to create imagery for LED wall projection is that **unlike rear-projecting pre-rendered footage, the imagery shifts in perspective, creating perfectly synchronized parallax to the camera.**

As a result, the imagery is so believable, it's difficult to tell where the live-action ends and the screen takes over.



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### Kaya Jabar

*"Scenes featuring real-time LED walls will also be a major help to your work as an editor. Instead of receiving footage with actors in front of an otherwise blank green screen, you'll have completed shots. You'll have the entirety of each take from start to finish available to you versus just the portion with visual effects in progress."*

## Quote

### Felix Jorge

*“How does LED wall virtual production come into play? It’s going to change the way films are made entirely. We’re doing a lot of tests with it. We’re pushing the engine in a lot of different directions and testing the ray-tracing aspects of it. We can hit 90 frames per second on a pretty standard computer and have photoreal, production-ready environments on a decent scale. I see it as a similar business model to mocap, where you can arrange a stage and get practically unlimited amounts of footage. It’s a revolution for asset creation, set design, production designers, and DPs. If you’re shooting in front of an LED screen into Unreal, you can modify your environment live on set. It feels like you’re shooting a production with classic rear projection as they did in the 40s.”*

### Alex McDowell

*“Production design is further transformed via virtual production with real-time LED wall technology to seamlessly blend foreground sets with digital set extensions. You’ll be able to create more fantastical and elaborate set designs than ever before. This requires close coordination with the virtual art department in order to determine which portion of the foreground set should be built and where the virtual wall set should begin.”*

### All quotes used:

Source: Unreal Engine Virtual Production field Guide V1.2.02.  
(<https://we.tl/t-g3fJSYB2oy>).