The Mandalorian and Virtual Production's Future

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On the face of it, The Mandalorian (Disney+) can be seen as a mass-market derivative work based on an extremely successful IP. This isn't necessarily untrue, however, its approach to filmmaking has ramifications for the wider TV and film industry.

The 'Star Wars' series is set in the years after Return of the Jedi, and follows Mando, a Mandalorian bounty Hunter, (the same race as fan favourite character Boba Fett from the films) as he's tasked to retrieve a Baby Yoda to be experimented on by the Evil Empire. Ultimately he has a change of heart and saves the kid. They go on the run to try and repatriate Baby Yoda with its people. The series draws from the greater Star Wars canon, folding in ideas from The Clone Wars (Cartoon Network/Disney+) and the wider media landscape from novels to comics, and the sequel films. Fan favourites like the Jedi, Asoka Tano, make guest appearances and will be spun out into their own series. It's a well written and well-directed TV show, which is a testament to both Jon Favreau's (Swingers, Iron Man) direction and writing, and Dave Filoni's (Star Wars: Clone Wars) unmatched knowledge of the Star Wars lore. There is also the the star-studded guest directors like Taika Waiti, Bryce Dallas Howard, and Rick Famuyiwa, who bring their own flare to the series.

However, it's not the storytelling that is the most ground-breaking aspect of the Mandalorian—Disney tends to be pretty good at building large sprawling cinematic universes. The production of the show is mostly filmed on a soundstage, but instead of filming against a green or blue screen like traditional VFX heavy screen media, it is filmed in front of LED screens. These screens, which surround the subject, allow for real-time graphics to be 'projected' onto them, essentially transporting whatever is in 'The Volume' into a different world. Virtual production has now matured into a viable tool and will change how the film and TV industry works.

The Mandalorian's In-Camera VFX uses a 360-degree set of LED panels, with an LED roof, to envelop actors and props to give realistic lighting, as the walls are essentially a giant light source. This helps sell the illusion that the subjects are truly within the environment. Cinematographers can light and frame the scene much the same way that have done on real sets with the interactive nature of the screens. An example of the advantages of using LEDs as a light source is Mando's armour. It's shiny so reflects what is surrounding it. This isn't a problem with a 360-degree image, as it's reflecting what is physically around it. If The Mandalorian was to shoot on a green screen, a VFX artist would have to manually rotoscope each frame and replace the background, while also simulating how the armour would distort the image. It also allows the cinematographer to have more 'natural' looking light sources; for example, if there is a fireplace on the LED screen, then the light from the screen is actively lighting the subject, negating the need for cinema lighting.

The LED screen 'Volume' is run using the Unreal Engine, which is primarily a games engine used on titles such as Fortnight and Gears 5. The camera shoots the subject and the screen together, and, with the right parallax, gives the impression of space. By using the game engine, the assets in the background can move in sync with the camera by using trackers. This positional data is fed back into the engine allowing for accurate parallax to be achieved. Parallax is a subtle effect, and most viewers would not notice it but as a famous YouTube Star Wars critic once said, "You might not notice, but your brain does."

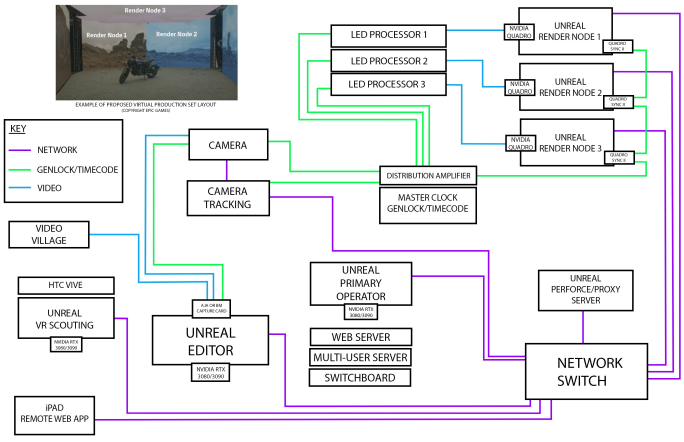
Virtual Production is nothing new, they have been using a rudimental version of the tech for years with driving scenes using rear projection, see the James Bond instalment Dr No (MGM) for a famous example. But this early technique has limitations, as the two planes of

action, the car and the background has no spatial relationship between them. This leads to an unnatural looking comp. It is a problem that using a games engine, like Unreal, can solve.

Another advantage of using In-Camera VFX is moving the VFX process from post-production to pre-production and production. The VFX artists are not constrained by what the cinematographer has chosen to do on the day and can collaborate on-set, allowing for input from every stakeholder. Using VR, set dressers can manipulate objects within digital space months before getting on set and know exactly what they're getting. Directors can also hit the ground running, having recced before they get on set and make complex pre-viz easily. This process of bringing VFX artists on projects early allows them to become more involved in the filmmaking process and free up time for more complex VFX sequences in post.

The Process of setting up a Virtual Production Set is a complex one. The Mandalorian costs millions of dollars to make and benefits from the Walt Disney Companies resources. However, it's not impossible for mid to lower end productions to harness the work that Industrial Light and Magic and Lucas Film have achieved. With some high-end workstations, LED screens and the means to track cameras through space, virtual production can be actualised within a modest budget. Of course, this is not to say that it would be an easy endeavour, but as the diagram is a working diagram of a full virtual production stage that would cost £300,000, which within television and film budgets is highly achievable, even on the low end.

PROPOSED VIRTUAL PRODUCTION SCHEMATIC



Five years ago, a project like The Mandalorian would not have been possible. Realtime graphics have only been viable for Film and TV work in the last few years with the introduction of Nvidia's GTX and RTX graphics cards. What would once take hours of compute time in a traditional render farm now takes milliseconds. The constant improvement of graphics technologies with technologies like Ray-Tracing, higher polygon counts, and improvements to the efficiency of the engine, will allow this technology to get better with time. It's a testament to how technology influences storytelling and opens up possibilities to Film and TV makers from the indie to the high-end. The Mandalorian is the first big step for In-Camera Virtual Production, let's see where it will take us (hopefully to more galaxies far far away.)