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CG GARAGE PODCAST #266 | JUAN GOMEZ
LEAD TECHNICAL ACCOUNT MANAGER, EPIC GAMES

What is "virtual production?" Epic Games' Juan Gomez tells Chris Nichols how technology from the games industry is sparking a filmmaking revolution.

Like Chris, Juan Gomez worked at Digital Domain on some of the company's biggest and most innovative projects: *The Girl with the Dragon Tattoo*, *Maleficent* and *Tron: Legacy*. But Juan has followed a different career path, first into the world of virtual reality at Method and on to Epic Games, where he's spearheaded game-changing real-time virtual production for movies.

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Chris Nichols   You like it?

Juan Gomez   Yeah.

Chris Nichols   Yeah, it's good. Yeah, it was much more rinky dinky and then we started to get better and we're like, "Let's make this into a new furniture" and everything sounds like-

Juan Gomez   Legit.

Chris Nichols   Legit man, legit. Yeah. Well, dude, thanks for doing this.

Juan Gomez   Thanks for inviting me.

Chris Nichols   Yeah, man. It's been good. It's been really good to reconnect with you and see some of the cool stuff you're doing. What I always find interesting is that even though there are people that I've had on, who I've known for a long time, who have been... I've always found out that after I talked to them on the podcast, I found out all kinds of crazy things about them that I didn't know even though I'd been working with them for years. Let's start with some of your origin story. How did this all start for you? How did you start getting into CG and doing all this stuff you're doing, man?

Juan Gomez   Yeah. I have the coolest story. When I was in high school, I always was... I was in Columbia, always watched behind the scene, the making of-

Chris Nichols   Making of.

Juan Gomez   I was like, "Oh, this is awesome." I never thought it was going to be possible for me. In Columbia, we never had a big movie industry especially on special effects definitely not. I was always intrigued about... I played a lot with fireworks. Dude, I was crazy with fireworks. They used to sell this sheet of paper with little explosives and then I would buy lots of them and then wrap them into a ball and then when I hit it hard with a piece of wood and then it will make this big explosion and it will splatter everywhere. But then I started taking chemistry class and my first class I heard, "Okay, these elements here on the left are highly reactive." I was like, "Highly reactive? What do you mean?" "Yeah, they can explode. They can explode even with water." I was like, "Really? Which one?" He was like, "This one." "Okay, potassium. Okay, got it." Then I call this random place in Columbia and like a lab. I was like, "Hey, I need to buy potassium." They were like, "What do you need it for?" I'm like, "No, I've been assigned a science project at school." They were like, "Fine, what kind of potassium?" I'm like, "Whatever, potassium, give me some potassium."

Juan Gomez	They gave me this potassium that it's only you put in water and then it tints the water really nice. You have these really intricate shapes of ink just moving, really cool for actually shooting. I was like, "No, this doesn't work for me. I want an explosion." I called them back the next day and I was like, "No, no, no. I need something that explodes with water." They were like, "What? No, no, no. What are you doing? This is really dangerous." "I know, don't worry. My teacher allowed me to buy it." They were like, "Okay, fine." Then I got this metallic potassium. Then I got in this tin jar, really it looks scary. It was fine, and the people told me, "Be careful, be careful playing with this because even with oxygen it can explode." I was like, "Okay, no problem." I was really afraid. I opened it with my friends that we were with, these really long pieces of a stick trying to take it out of this liquid. It came in this oil and we were really afraid that it was going to explode. Then we took it out and nothing happened. We're like, "Okay, what's going on?" Then we, with a hose, we just put some water on it and then saw it... big explosion. We're like, "Oh, this is awesome." Then we started to experiment with it and then we realized this, the harder you hit it with water, the louder the explosions. Then we all started getting really confident and now we were grabbing it with our fingers and throwing it into the pool. Obviously, it was a lot of fun. Then I'm like, "Okay, I want to do effects, I want to do effects." I moved to the United States, I started doing electrical engineering because I didn't know what to do.
Chris Nichols	Yeah. Where did you go?
Juan Gomez	First I went to San Diego State, like a little... starting and then went to a college. I just wanted to create stuff. I knew I wanted to be... I just wanted to create. I thought maybe engineer. I thought maybe creating lasers. Then when I was doing engineer, I started discovering computer animation. Then I took a lightweight class and I was, "Oh, yeah, this is it." Then I switched, I decided to switch majors. Actually, I met this Colombian guy who used to own a company called Angel Studios. It was a video game company in San Diego that later on got acquired by Rockstar.
Chris Nichols	Oh, right. Okay.
Juan Gomez	Then Rockstar Engine was actually Unreal, it was Angel Studios Engine. Anyway, he introduced me to a lot of people. I was like, "I want to study this." A lot of people started telling me, "Okay, go to the Academy of Art. I ended up deciding to switch majors and I've been enjoying it a lot since then.
Chris Nichols	Right. That's what got you in, right?

Juan Gomez	That's what got me in. The behind the scenes, just thinking about looking at those.
Chris Nichols	Looking at cool stuff, yeah.
Juan Gomez	Just experimenting with fireworks.
Chris Nichols	All right. Where was your first break? Where did you get your first break in this stuff?
Juan Gomez	I was extremely passionate at school. I was doing all these super cool projects. I even won, like they had their spring show at school. Right before I graduated, the ESC, Escape, it was a company that was making *The Matrix* at that time. Came to us-
Chris Nichols	Yeah, yeah, in the Bay Area.
Juan Gomez	... in the Bay Area, Alameda. They came to the school and they asked the school, "Okay, give us a big edit of everybody's demo reel and it cannot be longer than 30 seconds or 15 seconds." Okay. I was like, "Perfect. I got my chance, I got my shot." Yeah, it went well. I got offered an internship to work on the last *Matrix*.
Chris Nichols	At ESC, right?
Juan Gomez	ESC, yeah. Thanks to also a good friend of mine Andres Martinez.
Chris Nichols	Oh, yeah, Andres.
Juan Gomez	He was a supervisor over there at that time and I couldn't believe it. I was joking every time with my friends at school. I'm like, "Oh, the Wachowski Brothers are waiting for me to graduate so I can help them on the last *Matrix*." There you go, the universe gave me-
Chris Nichols	Yeah, I guess you knew Litt and Parker and those guys, that's where you met. Yeah.
Juan Gomez	Yes. Yeah. I work with Jonathan Litt. A lot of people that I actually still work with, I know them from Escape.
Chris Nichols	Right. Okay. You were at Escape for a while.
Juan Gomez	I was there for a couple of movies and then the company shut down. Then in the Bay Area, there's not many places that make visual effects. I started looking for places and I ended up coming here to Los Angeles. I started working for a small place, kind of like a startup place for movies

	like TV channels, SyFy and TNT and all this stuff. That company closed again and then I ended up working at Digital Domain.
Chris Nichols	Right. What was your first project at DD?
Juan Gomez	It was actually using V-Ray. Yeah, because they start... it was a car commercial. They just finished the Nine Inch Nails-
Chris Nichols	The Nine Inch Nails thing, yeah.
Juan Gomez	They just finished that one. It was really well-received, V-Ray in Digital Domain. They were looking for more V-Ray for 3ds Max V-Ray artists. I was one of them and then I started in a lot of commercials using V-Ray for 3ds Max. Eventually, we started working on the *Gears of War* commercial.
Chris Nichols	Right, with Joe.
Juan Gomez	With Joseph Kosinski, using the first time Unreal Engine.
Chris Nichols	Oh, right. Yeah, yeah, because that was done all in-engine.

Making *Gears of War's* "Mad World" trailer in-engine

Juan Gomez	That's what Epic said: "Okay, Digital Domain, you guys are really good at doing cinematic work. We want to make a commercial for *Gears of War* that is cinematic and we're going to hire a director," all that stuff. They gave us just the PCs with the entire *Gears of War* assets. None of us knew Unreal Engine at that time. No documentation and we were like, "Okay, let's try it." I was extremely happy because it was literally playing with Legos, modules. You have the existing product, you have this amazing work. Everything was looking really good. We were pushing and pushing it and it was a hit. That commercial, it was the "Mad World" commercial.
Chris Nichols	Yeah, yeah, yeah. I remember that commercial. That was a pretty big deal because he had done I guess another... He'd done a *Halo* commercial before that, right?
Juan Gomez	Yes. No, actually the *Halo* was... I think it was after.
Chris Nichols	After that. Maybe he did another *Gears of War*.

Juan Gomez	He did, yeah, we did a couple with him. This first *Gears of War* commercial was supposed to be directed by David Fincher.
Chris Nichols	I remember now. Yes, that's right.
Juan Gomez	David Fincher was like, "You know what, I'm too busy doing movies" or whatever. He's like, "I have this new guy that I think he's going to work for you guys." That was Joseph Kosinski.
Chris Nichols	Yeah, yeah. That was Joseph Kosinski's job. I know you worked on *Tron*; did you work on the teaser?
Juan Gomez	No, I didn't work on the teaser. I worked on the movie. That's when you came to-
Chris Nichols	You and I, yeah. That's when you and I first met. It was on the *Tron* thing which was a big show.
Juan Gomez	It was a big show. It was good fun.
Chris Nichols	It was really a good show. Yeah, It was a lot of fun. Yeah, it was a lot of fun, lots of learning we did on that show.
Juan Gomez	At that time we just finished... I think it was *Benjamin Button*-
Chris Nichols	You finished *Button*, right? You worked on *Button*, right?
Juan Gomez	I worked on *Button* but before that we worked on *Speed Racer*.
Chris Nichols	All right.
Juan Gomez	We were in this Mental Ray world at Digital Domain, we were really... Because *Button*, *Speed Racer* and then we needed to do *Tron*. It was a challenge to do *Tron* in Mental Ray.
Chris Nichols	The challenge mainly was about motion blur.
Juan Gomez	It was about motion blur. It was a lot about refractions. Definitely motion blur was the challenge.
Chris Nichols	Motion blur was a problem, yeah.
Juan Gomez	It was extremely slow to do correct motion blurring in Mental Ray. We had to do a whole bunch of hacks in *Speed Racer* just to get decent render times. I used to use Mental Ray a long time ago on The Matrix and I

remember we got tasked just to try V-Ray because at that time V-Ray was starting to be integrated in Maya.

Chris Nichols   Right, yeah.

Juan Gomez   I remember sending an email to Vlado and I was like, "Hey, Vlado, we have this really high profile project" and I think you were not yet in the project. We're like, "We want to try this." Then suddenly we started doing some tests and quickly we're able just to get really, really good results. Then that's when we decided, okay, I think it's time for us to switch to V-Ray and then we brought you in.

Chris Nichols   That's when Eric got me in to do it as well. It was fine. It was a big transition. It's very, because it kind of happened in the middle of the show where we decided to switch render engines which was really risky. They did everything. Everything wasn't Mental Ray and slowly we switched one by one by one, a whole sequence into V-Ray. The only thing that stayed in Mental Ray was the head because that was far enough established that they didn't want to mess with it and it's complicated to do heads. That was the only one.

Juan Gomez   I think we started doing heads in V-Ray maybe... actually the Tupac. In the Tupac was, yeah. Tupac was V-Ray.

Chris Nichols   Tupac was V-Ray, *The Girl with the Dragon Tattoo*.

Juan Gomez   *The Girl with the Dragon Tattoo*, that's the first one.

Chris Nichols   That's the first one.

Juan Gomez   Yes. We were both in that same show.

Chris Nichols   Yeah, I liked that show. It wasn't that complicated but we were really, really good about it. I remember actually working on it with you where we were working on some of those, the bike sequences where you, if you watched the movie, you wouldn't realize that some of those were all CG because they cut perfectly with the live action. It was amazing work.

Juan Gomez   Yeah, and it was fun especially after the *Tron*, we were-

Chris Nichols   Burned out.

Juan Gomez   Burned out, yeah.

Chris Nichols   Yeah. It was a little bit more like, "Hey, let's just do something." It was a very different look than *Tron*, it was much more gritty and dirty and *Tron*

was all perfect and clean and everything. It was kind of fun to do that, yeah. Did you work on Tupac?

Juan Gomez   I was in the same room.

Chris Nichols   Okay. Yeah.

Juan Gomez   I did help a couple of little things here and there.

Chris Nichols   Okay. Yeah, because I know you and I worked on that Halo spot.

Juan Gomez   Yeah, that was cool.

Chris Nichols   That was really cool. That was really hard because I basically was given the task of having the very, very, very small team. There were only six of us that did the whole thing.

Juan Gomez   And really short time.

Chris Nichols   Really short time. The hours were insane to get that done but it was Joe, and Joe was nice, which made it work.

Juan Gomez   It came out good, I liked it. I liked how we did a whole two-and-a-half-D approach. A lot of reprojecting the diffuse maps on the spectrum maps and-

Chris Nichols   Yeah. Instead of just texturing everything, let's just project it. Right?

Juan Gomez   Yeah, it worked. It worked. Awesome.

Chris Nichols   It did. It did work pretty well. Well, that was cool and then I know you worked on *Maleficent*. That was another big show for you. You worked on those fairies for a long time, right?

Juan Gomez   Yeah, I did work for not a lot of time but I did work at the beginning and that's when we were pushing it, pushing it, the digital humans in V-Ray and I remember it was like, "Wow." I was really impressed with the quality that we're getting out of it.

Chris Nichols   Yeah. It was a lot of work on that one but it was really cool. All right. You after that, you left DD at some point and you went to Method, is that right?

Juan Gomez   That's correct.

Chris Nichols   Did you work in visual effects at Method or how did you get in? Because I know you ended up doing VR work there? How did that whole transition happen?

Juan Gomez	Yeah, I started working at Method CG supervising movies and then I was trying to find... it would be the right way to find ways to speed up look dev in lighting. That's when you guys just started doing V-Ray RT and they were doing with the VCS racks and GPU. I was like, "Okay, that's the future, that's what we need to do." I started getting... I got a hold of a really nice Nvidia GPU card and I started testing. I wanted to test, "Okay, is this ready for real-time look dev?" We were working on *Ant-Man* and we started testing.
Chris Nichols	Oh, *Ant-Man*. Yeah.
Juan Gomez	It was really early stages of V-Ray RT. Some of the stuff was not supported at the time, soft surface probably was not supported. I remember working with Chaos Group giving them kind of feedback, "Hey, this is not working." The simple things like simple operation systems, I don't know, maybe ramps or multipliers that were not working at the time. We didn't push it as far but they saw me as a person who was really interested in real-time. At that time Method had created this real-time previews department and they were using CryEngine. They did a couple of shows using this. Then Peter Shipkov was leading this team and he's like, "Juan, you're really interested in real-time, come over and join our new group, we're going to do this VR startup within Method Studios." Then that's when we decided, when they created these teams, that was called Deluxe VR.
Chris Nichols	Right. It was an offshoot of Method, right? A small team.
Juan Gomez	Small, really small team.
Chris Nichols	Okay. What kind of content were you guys making?
Juan Gomez	We were doing a lot of... we wanted to do VR and at that time we did a couple of test projects like we did a short film in VR. We did a small game in VR and we did kind of a jet presentation, like a fighting jet. I think it was an F17 or something. We started first understanding and learning the technology, the medium and how we can actually sell something, how we can actually make money using VR. We discovered the enterprise industry was the only one who had the budget and were willing to pay for the VR experiences. Then we started working with GE and then we started working with Time Magazine, doing all these kinds of different VR. Then we started working on *Justice League VR*, *Robin Hood*; they're mini games. A lot of different smaller-
Chris Nichols	Smaller experiences.
Juan Gomez	... experiences. This is one, once again, I got back into Unreal Engine.

Chris Nichols   Okay. You guys moved away from CryEngine at this point?

Juan Gomez   Yeah, we moved away from CryEngine. CryEngine was much more
                    complicated to do VR and we were using Unity and Unreal Engine. But I've
                    been a big fan of Unreal Engine since early 2005 or something with *Gears
                    of War*. I was really happy again just to start jumping into Unreal Engine. It
                    was a much better game engine.

Chris Nichols   Sure, sure, sure, sure. Okay. Eventually this led you to working for Unreal
                    itself, right?

Juan Gomez   Yeah.

Chris Nichols   How did that happen?

Juan Gomez   When we were working at Deluxe VR they changed their name to Method
                    EXP, just to bring it back under the Method umbrella. We were doing this
                    really big project for Apple in AR and we knew it was extremely
                    challenging. These are projects that Apple was pushing the envelope. We
                    were doing a test between Unity and Unreal Engine and then Epic kind of
                    found out. He's like, "You guys have to use Unreal Engine. Whatever you
                    guys are doing, whatever you guys want to do, you can only use... do it
                    with the Unreal Engine and we will support you." Suddenly, they send
                    people to work with us for two weeks. The developers were in a really...
                    we had amazing support but when I saw that, I was like, "Wow, this is an
                    amazing company."

Chris Nichols   Right. Just to turn it full circle. This is Kim Libreri who was the VFX
                    supervisor on *Speed Racer* so you'd already worked with him. But he's now
                    the CTO of Epic. Right?

Juan Gomez   Correct. This is definitely, it's a small industry, it's a small world. A lot of
                    people from *The Matrix*, like Kim Libreri was the VFX full effects
                    supervisor of T*he Matrix*. He's now the CTO of Epic Games. There's a lot
                    of people that they stole from *The Matrix* and they work at Epic. It's cool. It
                    goes full circle and I really liked the product, Unreal Engine and the
                    support is amazing, the culture. I was like, "Okay, I definitely, I want to be
                    part of this company." I found out that they were going to open an office in
                    LA.

Chris Nichols   Yeah. That's how you got into it. Nice. Now the office that's in LA, because
                    I went to visit you guys. I know you guys are in a WeWork which is really
                    cool but you guys are going to open up your own space because you've
                    grown enough here, right?

Juan Gomez   Yes.

Chris Nichols	One of the main areas that you guys are focusing on in the LA office is virtual production. Is that right?
Juan Gomez	Correct.

Defining virtual production

Chris Nichols	Yeah. This is a new buzzword. Everyone's talking about virtual production and virtual production this, virtual production that. But unfortunately, you and I had a great conversation about understanding what virtual production is and I think we need to clarify that a little bit and sort of define that because sometimes people are very loosely using the term virtual production. I make the joke that is like people are saying it's virtual production, like me saying, "My cruise control is autonomous driving," right? There are different levels of cars driving themselves and cruise control is just step one. Right? Virtual production, how would you define what virtual production is? Then let's go through the different levels from there.
Juan Gomez	Yeah. Multiple things are considered virtual production. But I define virtual production as a set of tools that allows you just to visualize. Virtually do a production as the term is. It can be from something as simple as using an iPad or an iPhone using ARKit or kind of computer vision technology that allows you to replicate beautifully a camera. Then you can certainly have a beautiful camera in your hands with an iPhone or on a mobile device. Then you can go as far as... Some people are, in production, using simul-cams which is being able to have a camera, a physical camera, that has been tracked real-time and it creates a representation of that camera in the virtual world. Then you can overlay a CG component on top of the plate or behind the plate which is more of an AR augmented reality experience. That's what I consider part of the virtual production. There is a lot of tools and hardware that are part of this technology. They have motion capture system that... excellent suits, inertia-based systems that allows you just to capture performance and beautifully apply that performance into a character. Now, with the new thing that we've been working on lately, the in-camera VFX, some people are still considering that as virtual production. But we are defining that as an in-camera VFX, just to make it clear.

Chris Nichols	That is something where you have a big LED wall or something or a projection of what's going on and then the actors are performing there. Right?
Juan Gomez	Correct.
Chris Nichols	Then the camera tracks that motion and gives you the correct parallax that's going on.
Juan Gomez	Correct. This has a lot of the components of digital production. Some people just might consider this as a virtual production because it has the camera that is being used to photograph the talent. Or the set is being tracked real-time so they can actually correctly replicate the camera in Unreal Engine. Then Unreal Engine will feed the image on the LED wall that matches exactly the perspective from the camera. It's a way to do a virtual extension of the set. Then you get the accurate lighting contribution into the subject or the actors and you get the reflections, the accurate reflections from the environment because you actually can't have 270 degrees of coverage. It's almost like you're inside of a cylinder or a cube or something surrounded by LED walls that emit much more light than a projector. Then you have the true perspective changing in real-time based on the camera position.
Chris Nichols	The first time that people really kind of might've seen something like this is when they did *Gravity*, right?
Juan Gomez	Yes.
Chris Nichols	When they did *Gravity* it was... that's how they got all the lighting on their faces to match and all of those crazy camera moves that were going on which was really great. But it sounds to me like this all starts with tracking. You have to track something in real-time, right? The tracking stuff is not new to the industry. It's been around for a long time. Obviously motion capture has been around for a long time. Live tracking has been doing that in that world and obviously there's been programs like MotionBuilder, et cetera, et cetera. What's been interesting to me in the real-time in the tracking world — or which ends up becoming virtual production now — is that companies like Unreal have suddenly started to play a role in this area in a very interesting way because the power of that program is that it can do a lot of things in real-time, right? Suddenly, Unreal, which was designed to help you make video games-
Juan Gomez	Correct.

Chris Nichols   ... is being used to do other things that are also real-time, right? Virtual production is really, it's like building a video game of your set and then saying action, right?

Juan Gomez   Yes. Exactly. Yeah, it's a way of bringing this virtual world into the set. Unreal Engine does an amazing job just creating beautiful pictures, beautiful images. The rendering is amazing.

Chris Nichols   As in real-time.

Juan Gomez   As in real-time, yeah. You can have a scene that can run 90 frames per second, 120 frames per second, whatever, and they look still really, really good. We have examples of amazing looking projects at 30 frames per second, 60 frames per second with digital humans, with ray tracing. I mean, the technology is advancing so fast that the quality is really close to offline rendering.

Chris Nichols   Right. What is interesting to me is not necessarily that it's close to offline rendering which... it's getting there for sure. It's more about the... What I find is fascinating about the virtual production area is that, it's because it is basically real-time that what you're seeing is very, very close to final. If not, sometimes you can even at some point it will become final but, it's close to final that there's less guessing about what you're going to get, right? You can iterate faster because it's real-time, right? The thing that I think is fascinating about virtual production is that when you and I were doing visual effects and Joe for example would come by for Tron and he's like, "Okay, this is what I want." Then he's like, "All right, well, then come back in a couple of weeks and we'll show you a shot." All right? Because, that's the process that we had to go through to do that. But now, there's a situation where you're very close to, the director is now on a virtual set and directing what he wants or she wants and says, "No, move this, that there." The decision making is being done in real-time. The decision making in real-time is what's very interesting to me because I think if you do that... You and I, we're very good lighters, we love to light in CG and in V-Ray, et cetera. But we were not technically the DPs of the movie but we're trying to say, I guess the DP wants this, right? What if the DP says, "No, this is exactly what I want" and makes that decision live on set. It's a different game, right?

Juan Gomez   Yeah. You bring a good point in this and I also... Unreal Engine now is not about making beautiful — like, it's a beautiful picture in real-time — but it's about helping people making the decisions on the fly. It's really cool because this technology is now bringing everybody together on-set. By now, you have the lighters, the animators. A lot of people on-set working with the director because we can with the LED wall technology in-camera VFX, they can see in camera what they're going to get. We enable, we

create tools with an iPad and a simple interface, then we can give the DP the tools that he needs in order to light beautifully the set. Suddenly, they are like, "Okay, I see. I want to get a sunset." I can go really hard on my practical key light because I can see that the environment is actually, meeting that, kind of, rich hue and you basically see what the CG is supposed to be doing to the plate to the real talent. Then, you can go in, "Okay, I'm not afraid to guess anymore. I know how I need to light this correctly in order to match the environment that I'm looking for." Or they can actually, just frame because now you can closely visualize what is going to be the end result. Now, the DPs and the camera operators can actually, do the angle that they didn't think was going to work. Now they can go crazy. "Okay, now I can go with this low angle with this lens. I can go long lens" and everything is because you can actually preview right there. "Okay, if I do this angle, I can still see the creature behind the actor and I can still get a nice over-the-shoulder shot," or something like that. Now, instantly you can actually, decide, make a decision the director says, "Yes, this is what I want. Let's shoot it." What we're trying to do, is being able to get final shots in camera with this LED technology.

Chris Nichols
Right. That's, yes. That basically, those types of decisions used to be done during a process called previz. Previz was basically the idea of creating let's say not necessarily final quality but super fast iteration versions that you could go through but it was still somewhat offline, right?

Juan Gomez
Exactly.

Chris Nichols
It's like, "Okay, see this shot, change it." Then, you have to wait a few hours or whatever and you get the next version, you get the next version, you'd, kind of, go through it. It was a very tedious process and a hard process, right? But it still limited your decision-making because of that process. Do you think virtual production is going to affect the way we think about previz?

Juan Gomez
Oh, yeah. A lot of the movies right now are doing previz with virtual production tools. I know there are some projects right now. Movies that they don't want to do a storyboard. They just want to do virtual production previz.

Chris Nichols
Right from the beginning.

Juan Gomez
From the beginning because you give the director and the DPs an iPad or a prop that kind of looks like a camera that they can hold and it's tracking either with a Vive or it can be tracked with optical tracker or mouse or whatever. Any kind of system. Then suddenly, they are able to play with a previz scene because the quality is quick and dirty.

Chris Nichols
It's blocking.

Juan Gomez	It's blocking. Yeah. Is great boxing, so to speak. But now, they can physically shoot it virtually. Now, they go straight to, okay, let's do something like and they're calling this a "storyviz." They are visualizing.
Chris Nichols	Storyviz, interesting. Yeah.
Juan Gomez	Storyviz is just, they go with the script and they have the script and say, "Okay, I see this through the script, let's play around with something. Let's play around with some cameras. Let's do some quick previz." But now, the same previz is used in the virtual production tools to allow them to just to, kind of, physically shoot it virtually.
Chris Nichols	Do you think that basically this really started when you're tracking the camera. That's the big change, right?
Juan Gomez	Yes. Yeah. Because the big change is just to give... Because, moving a camera with a mouse is not fun.
Chris Nichols	No, no, it's not.
Juan Gomez	I think once you give a cinematographer a physical object that they can operate as a camera, then suddenly they're like, "Okay, it's easy. I'm not intimidated by technology. I'm not intimidated by a computer. I can just do my cinematography with something that looks like a camera." That really opens the door to enable this technology to the filmmakers.
Chris Nichols	Right. Yeah, it was very interesting because I remember Kevin Margo when he was working on "Construct" and he had a trackable camera that he was using. They actually motion captured the whole fight sequence and really good stunt guys who did it and it was great. They just did it without a camera and they just did it. Then, basically they took all of the fight and instead of them doing it over and over and over again, filming and filming and filming it, they just had all the performance captured. Then, he went in on a weekend, set up a cheapy motion capture stage in a conference room at Blur and just took the camera and just made like 30 different cameras of the same thing. Then, he like took all those takes and cut it into a fight sequence after the fact. It's just, kind of, interesting to think about all those things that this technology enables you to do. Like, all right, yes, I don't have to sit here and have the entire crew perform over and over and over again. I can still save that performance and go and see what I can get out of it on my own. Tracking a camera is actually interesting because it's simple. You're only tracking one point in space in a direction.
Juan Gomez	Exactly. Yeah. As long as you don't have to encode the lens, it's really simple. Translation one single point, translation rotation.

Chris Nichols

Right. You could transcode the lens. It's not that hard to do. You just need a little transcoder or something but it's fun. I mean, I think, I remember even Kevin, he was playing around with... They created some, kind of, a box that they got out of parts from Fry's with a little encoder and a Wi-Fi connector. They connected it back to the computer and they basically created a remote focus puller. When you do that little manual thing, it feels more natural, right? Yeah.

Editing inside Unreal Engine

Juan Gomez

Yeah. One thing that is also cool is, you give them, the cinematographers, the virtual camera. Then, now you can also edit in inside Unreal Engine. Then it's even faster because you go in, you shoot a couple of things and then you update on the fly, you edit inside Unreal Engine. It has an editing system. Then you can quickly say, "Okay, let's try this on" or say, "No, this doesn't work. I just need another shot. Let's do a pickup shot." Then, you go in and then, let's shoot this action from another angle. I mean, because you have the motion captured data in the system. You just basically replay the same action but then you shoot it with another camera angle. You record it, then you update the ad and then you say, "Okay, this is going to work." The whole cycle is so tight now. It's so small. You have the guys performing with an Xsens suit right down in front of the director. You have the camera, then you have the edit. It compresses the length it takes to explore a shot.

Chris Nichols

Yeah. What about the post process? What do you think is going to happen there? Obviously, we know that the rendering is going to get faster and faster and faster. The quality is going to get better as we go. New technology, new GPUs, real-time rendering is getting better and better. I also think that there's going to be less ambiguity after it comes out of motion capture now because the decision is being seen live way closer to the final than it used to be, right? What do you think is going to happen in the post process? You think that basically virtual production is going to slowly become just production and you remove some of the need of post-production?

Juan Gomez

No, I think there is always going to be a need for post-production because in post-production you apply your art, sort of, to speak. It's just the final touches. What technology is doing right now with more advanced facial capture performance with more events, body capture performance, you're

getting more clean data, it's right. The data that you get from your motion capture shoot is useful. You can use it, you have to-

Chris Nichols

Do you think it's gotten better? Because, it used to, I mean, there used to be a lot of motion capture clean-up that we had to do before.

Juan Gomez

It has gotten a little better. It hasn't made as huge leaps as other technology. But I do see that the future it's going to get with all this machine learning and everything that's happening right now, it's going to get much more usable raw data. We have seen some of that with some of our friends. What is going to happen is you get out of your shoot a lot of good data that then later on post-production is just going to apply the artistic touches. Make it look beautiful, do a lot of beauty lighting. Now, let's go augmented, now let's do better simulation on the cloud or better simulation. I do believe that it's still going to be a lot of post-production but the tools are going to be faster anyway. There's going to be probably, as you know, there's going to be some really good... We currently right now in Unreal Engine, we just released the new hair system, which is really, really good in real-time. Now, the director can direct the actor motion, preview how much the hair is going to move based on the motion of the actor.

Chris Nichols

Interesting, yeah.

Juan Gomez

Now, you can actually start visualizing closer and closer to the end product so that the decision making, the art direction, every decision that needs to happen on the day of the shoot can be executed as is meant to be. Because then, Unreal Engine allows them to visualize the end product closer. Now, before as you know they might have a performance of an actor running too fast and this actor might be actually a creature that has a fur system. Then you realize that it was doing a lot of big movements and because of these big movements and the hair or the fur, that the performance was not going to work so they have to go and shoot it again-

Chris Nichols

You get it closer to what it's supposed to be, right? Yeah. You'll see if it doesn't work right then and there as opposed to down the line. Yeah. Let's actually talk a little bit about that being on set because I think you guys also do something that's pretty interesting. When you're doing a virtual production, now you have a lot more people that have different responsibilities that are on set. Before it was just motion capture, performers and the person that's capturing motion and then a director basically, sort of, directing the action. But now, you can have someone that's lighting, someone that's doing a live compositing possibly, someone that's doing a different directing animation or replaying different roles. There's a lot more people that can be working inside the virtual world. How do you get all those people to work all at the same time in the same world? You guys have a tool for that, right?

Juan Gomez	Yes. In Unreal Engine, we have something that's called multi-user editing and this allows everybody to work in the same scene. You have-
Chris Nichols	Is that not unlike all working in a game together, right?
Juan Gomez	It is, kind of, all working the game together. Yeah. It's-
Chris Nichols	Multi-user games, right?
Juan Gomez	Yeah. Multi-user is the same technology you-
Chris Nichols	You're in *Fortnite*.
Juan Gomez	Yeah, you're in *Fortnite* and you create your own city. You basically, multi-user editing allows you to just to have a scene in a server and every instance or every computer that has Unreal Engine can actually, just connect to that scene. Then you define roles to say, Chris, you're going to do lighting, John is going to do layout, so-and-so is going to be capturing the animation, so-and-so is doing the live action compositing. Everybody's working as a team. Then you can see avatars of everybody on the scene moving things around. This is now bringing again the VFX team into set. You now, you're going to be seen on set in an area that they call the Brain Bar. The Brain Bar is basically a whole bunch of CG artists connected all in with Unreal Engine into the scene. You have the LED wall that is being operated by three or four or five machines. Then, you have VR scouting that can be also in the same scene. Then the director or anybody can actually, just start seeing how the scene looks in VR and then say, "Okay, you know what? Next time we shoot it from this angle because it looks cool." Everybody's working at the same time in the same scene. That would actually speed up the decision making process quite a lot.
Chris Nichols	Yeah, I know. I love that idea. I think it's really great. I think that people should look at that and say, "Hey, who in the visual effects never wanted..." We've always wanted to be on set and see the decision making. Now, there's that opportunity for us to do what we do live on set in a virtual set.
Juan Gomez	I can tell you a little story. I was working on a in-camera VFX project with the Mill for a Louis Vuitton project, and then the director, because they are so used to traditional VFX and things like that shooting that I was operating the machine and then I heard him say, "Oh, man, I wish we could slow down the rain." I turn around and I was like, "Do you want me to slow down the rain?" He's like, "Can you do that?" I'm like, "Yeah." I slowed down the rain. He's, "Oh, amazing. What else you can do?" I'm like, "What do you want me to do?" Because everything is live and whatever I'm doing in Unreal Engine, it is displayed on the LED wall. Then suddenly, they

sounded like, "Oh, my God, do you know I can make changes right now when I'm shooting."

Chris Nichols — I don't have to wait till later.

Juan Gomez — They don't have to wait. They can make the decision. They saw me, they said, "You know what? The original speed that we decided to pick two days ago, now than when we see it in camera, is too fast. Or the length of the rain is too long."

Chris Nichols — Too long, right.

Juan Gomez — But now, because you're seeing the actor, you're seeing everything happening, you're like, "Oh, my God, I just wish I'd made the changes." Now, this allows them to do this instead of having to wait and re-render and all that stuff and things that are also because we were working in a scene while the other guys, they were the artists. Unreal Engine artists they were working in the scene that they were going to shoot next. They were still making changes on that. The minute we were done shooting the scene, we just uploaded a new scene into the LED wall. Shrinking the time again.

Chris Nichols — Yeah. It's like striking the set and bringing it back. That's a lot of time you just saved. Yeah. Yeah. That's really, really interesting.

Juan Gomez — Virtual production also allows you to see things that you never saw before. Like plan for things for example, when we were doing an old production with simul-cam, virtual camera and a little virtual actor acting in front of the real actor. The guy off-screen who was driving the CG character was acting with a real actor and it's only because they were in the same room, they were, kind of, feeling one another's reactions. Suddenly, the director started discovering new scenes. They start discovering new things that they could do that he didn't imagine before. Once again, virtual production allows everybody to see things in real-time and come up with new ideas or correct the original plan.

Chris Nichols — Yeah. Yeah. It's true. I think people don't realize the power of reacting to what you're seeing and making corrections on the fly. It is going to change a lot of filmmaking I think. I think it's going to make things more interesting and creative because you have more room to experiment with things that before you just... A long time ago, I was working on a show where we were still using old RenderMan and shadow maps, right? In order to change, move a light, I had to re-render all the shadow maps to the point where I was like, "I'm not going to move the light even though it probably would've been the better decision" just because it was such a pain to move the light. But what if you could just do it real-time? I was like, "That, that, that...perfect." Now, you don't have to make that decision. Just

the idea that, oh, the decision I make is going to take weeks to implement so I'm not going to make that decision. It's just not very good for the creativity or the look of things. The more you can do it live and in real-time the better it is for everyone. Why is Epic getting involved in this? What's the motivation with Epic to get involved in all these non-game things that are going on?

Juan Gomez   Unreal Engine right now is basically using all industries and it's because it is a platform. It is basically, it is a piece of software that allows you just to create content in one platform and distribute in multiple deliverables.

Chris Nichols   Deliverables. Yeah.

Juan Gomez   That's what is really, really attractive to a lot of industries. The quality, the image, the rendering quality is really high. Now, you can actually create a, for example, a car configurator that looks really, really damn good. Then that current configurator can be run on the cloud. These companies, they can actually, update the models at any time and they don't have to re-render these images or re-print these catalogs, right? Now, you create a project that can actually serve multiple purposes. There is also a lot of... making a real engine available to all the industries helps the product become better because now you have the media and entertainment world or film and TV world that they like to push the envelope. They want to like, give me a crazy amount of geometry real-time ray tracing. This industry's demanding for these and all these, we develop these technologies, we develop these tools and we enable all this technology internally and that will actually, feed the rest of the ecosystem. It's going to feed, it's going to end up making better video games, it's going to make better car configurators. By Epic paying attention to what other industries need, eventually it's becoming a better product.

Chris Nichols   Right. Okay. That's really one of the things. It's like this is about testing your engine in different environments. Is more, kind of, the motivation here, right?

Fortnite and the metaverse

Juan Gomez   Yes. If you pay attention to what's happening with Unreal Engine and *Fortnite*, you'll start seeing some changes in the way people consume entertainment. For example, in *Fortnite*, you have a Marshmello concert. Now, people are watching, and are participating in a concert virtually in a video game. This is the biggest concert in history-

Chris Nichols   In terms of people who are attending.

Juan Gomez   ... in terms of people who are attending.

Chris Nichols   You're right.

Juan Gomez   Virtually, and then you see *Star Wars* doing a release, a teaser inside *Fortnite*.

Chris Nichols   Right, yes.

Juan Gomez   Tim Sweeney, the CEO of Epic Games, he believes in this, this concept is called the Metaverse and you, kind of, start seeing this happening right now with Unreal Engine, Epic Games.

Chris Nichols   That's interesting. The Metaverse is really just an entire virtual world where you do more than play video games and you can do a lot of other community activities now, right? That's not necessarily a completely new concept, right? I mean you can almost, it's like *Second Life*. That's not necessarily a great example, but that was the idea: You can do everything here, you can buy houses, you can communicate with people, et cetera, et cetera. But now big community events are happening, big announcements are being done or whatever and so that world becomes a different world. All the lessons that you're doing, you're learning from virtual production, is that starting to enter into that server, right?

Juan Gomez   Yeah. The techniques that you develop in virtual production eventually are helping create this content that is going to be on *Fortnite* or anything. I mean, a lot of the game cinematics for *Fortnite* are done through virtual productions.

Chris Nichols   Yeah, that makes sense.

Juan Gomez   We have some videos out there just showing how we have three characters or five characters are the ones doing body capture, facial capture and we do virtual cameras in order to quickly iterate and make different decisions and explore. You can see this technology is being developed by Epic Games, using our own content and our own products and then we battle test it and once we know it's working, then that's when we release it to the public.

Chris Nichols   Yeah. It's interesting. I mean, I think what's interesting is that the virtual world could be a new environment that people interact with. I saw a... no, it was on a podcast, a technology podcast. I think it was The Vergecast, but they were basically talking about how the competitor to Netflix is not Hulu or HBO. The competitor to Netflix is actually *Fortnite*.

Juan Gomez   I know.

Chris Nichols   Because basically, the idea is it's what you're doing on your screen that's important, not like a competitive service and if you're in *Fortnite*, you're not watching Netflix, right?

Juan Gomez   Yeah.

Chris Nichols   But if you could go into *Fortnite* and *Fortnite* also becomes a platform where you watch equivalent to Netflix, then that's it, right? That becomes your entire universe, right?

Juan Gomez   Mm-hmm (affirmative).

Chris Nichols   That's interesting and it goes back to your VR a little bit really, right?

Juan Gomez   Yeah.

Chris Nichols   Yeah. Do you think VR is going to have a role to play in virtual production because I know that the Magnopus guys were using VR as part of that idea as well, so what are your thoughts about that?

Juan Gomez   Yeah, we have been seeing some good results with cinematographers using VR because suddenly they are immersed in this world and then suddenly virtually they are like, "Hey, let me see how this looks if I use a 70 millimeter lens, okay, let me change the lens and do a 24 lens."

Chris Nichols   They can look around the set.

Juan Gomez   They can look around the set, so they can look around the set. Suddenly, they look through a viewfinder, they look at the shot and they suddenly, you know what, maybe I should go to that corner-

Chris Nichols   They fly with it, yeah.

Juan Gomez   They fly there and then they... Allows them to quickly, once again, allows them to make faster decisions, explore.

Chris Nichols   Yeah. Yeah. Yeah.

Juan Gomez   Then there is a project out there, a Netflix movie called *I Am Mother*. This company is an Australian company, Pixel Studios I think is the name. They did this VR storyboarding and it was really interesting because they say, I just go in and then I have a set, a virtual set and they plan with VR, and then they take a still and then they do a storyboard virtually.

Chris Nichols	Right, right, right.
Juan Gomez	I've seen a lot of acceptance of VR from the filmmaking guys. Oh, yeah.
Chris Nichols	I think it's practical. I think it's practical, I mean, the whole point of VR is to take you to a place that you haven't been before, right? I think if it's something that you're working on, then you're doing something in the VR stance, then I think it makes sense to do that.
Juan Gomez	Yeah. It's also the notion of like, it's a little more physical because you are in the world and then you say, "Okay, I want to lift this rock." You're beautifully lifting the rock, you pick it with your controller and... You move in and they say, "Okay, we're going to move this couch." Then you move it, so then it becomes more physical. Then that's what we as humans have learned to do things, physically move around, let's climb that wall, let's go. Then it becomes, your whole body is engaged. The more that your body and your mind is involved, you end up having a better experience. There is a more intimate experience or rather than you in front of the screen with a mouse and a keyboard.
Chris Nichols	Right, right, right.
Juan Gomez	You feel limited in a way, handicapped. But when you put them in the world, you let them go to every single area that they can possibly explore and they look through a lens. Then suddenly they are immersed into the experience. It becomes up to my own-
Chris Nichols	Experience, yeah.
Juan Gomez	... experience. Yeah, it becomes so much better.
Chris Nichols	Yeah. Yeah. I agree. I think it's going to be very interesting to see what's happening. What are your thoughts about directors and how they're experiencing this? Are they having a hard time with it or is it just like it's... what's going on there?
Juan Gomez	I see a big change in a way before technology, computer CGI. It was only people with scientific majors who could touch it. Now technology, Unreal Engine for example, is making these tools much simpler. Now the technology is more friendly to them, so it's highly acceptable. Now you have Jon Favreau and all this. I mean, obviously, Jon Favreau, those directors are really technical, but then we are inviting a lot of new directors just to show them the technology and tell them, "Look, it's so easy. Just press this button and press this other button, touch this interface." Everybody is so familiar now with electronic devices, with

iPhones and iPads, that it's really easy for them. We make these interfaces to make it as easy as possible for them to interact.

Chris Nichols   Interesting.

Juan Gomez   Now the barrier is much lower.

Chris Nichols   But you guys can experiment with all kinds of stuff because it's completely new, right? You can make new interfaces all the time and there's no real standard, right? There's not like, I've learned on this interface and he's like, "Man, did we tell you we would give whatever interface you want," right?

Juan Gomez   Yes. A lot of the tools that you find in Unreal Engine, they are developed via blueprint, which is a visual programming that allows anybody to fully customize it. You can actually see people just creating slightly different UIs and different interfaces that actually work really well for so-and-so director. You can just say, okay, there is a DP that likes to use a specific lens kit and then you just build the lens kit in your UI. You only have to pick the lenses that that person likes. Yeah, it's fully customizable and it helps them be less afraid of the technology.

Chris Nichols   Yeah. Yeah. I think it's interesting. I think also, Chaos Group, we've obviously been very interested in real-time understanding our roles and it's a challenge because we're very faithful to ray tracing, right? That ray tracing is in our blood and what we're doing. We are very interested in understanding how we can bring ray tracing to real-time and where that happens. We were very interested in working with Unreal, that's why we created V-Ray for Unreal because we feel that there's still a big power of ray tracing that's going on. I think lighting and ray tracing are very different. We're trying to stay very faithful to full ray tracing, meaning no rasterization with ray tracing on top of it.

Chris Nichols   It'd be very interesting to see where that happens because what's interesting to me about Unreal, it's like, yeah, I'm very interested, obviously in the quality of the rendering and I think a lot of people are, but I still think that fully ray traced is going to be eventually what everyone is going to want to do. What I think is interesting about Unreal is the workflow that you guys are doing. The workflow is like they are creating the interface like, you want me to slow down the rain, I can slow down the rain. All those interactive things that are so important for that real-time experience, real-time is not just about the rendering. It's about creating an environment where everyone is working together. It's really cool, really cool. I'm fascinated by where it's going to go and how that quality is going to start to become better and better as you go, really interesting, really interesting what's going on there.

Juan Gomez	Yeah, enabling ray tracing in Unreal Engine with the new RTX technology. It opens more opportunities.
Chris Nichols	Oh, yeah, yeah, yeah.
Juan Gomez	Yeah, it is not a full through ray tracing because it's more expensive, but we have to keep in mind, it's just like we want to do 30 frames per second.
Chris Nichols	Yeah. Yeah.
Juan Gomez	We have to go around and do some tracing.
Chris Nichols	Yeah, but then see, here is the thing, right? You guys have a very powerful and very good quality rasterized render, right? You guys can capitalize on that knowledge and on that, et cetera. We don't know much about rasterization but we know a whole lot about ray racing, that's our thing. When we did Lavina, that was like, we're just going to go full on ray trace in real-time and we're able to get about 30 frames a second fully ray traced, which is tough. There are still a lot of challenges that we don't know about, right? It's very interesting to think about how that relationship works because I think that once we start getting fully ray traced stuff happening in real-time, then you're really going to slow... like, that window is going to become smaller and smaller where you basically, "Yup, that's the shot. You're done." I don't think that's going to be that far from now that we see what you saw, it's going to be pretty close to exactly what's going to be on the screen.
Juan Gomez	Yeah, real-time.
Chris Nichols	In real-time. Yeah. Yeah. I think it's really, really cool what you guys are doing. I think the virtual production is a key part of where we're going to go in terms of the filmmaking and I think Unreal is really doing a really good job with that. Now here's another challenge, people may need to learn how to use Unreal, but you guys are helping that process too, right?
Juan Gomez	Yes, we, yeah. We help a lot. We in our LA office, we offer classes every day.
Juan Gomez	Yeah, we have some amazing classes in the LA office, we have a production tutorial, actually.
Chris Nichols	Oh, really? Nice.
Juan Gomez	Where you have an Xsens suit and then you have a V-Cam and then we teach you how to do virtual production.

Chris Nichols	Nice.
Juan Gomez	We have a Blueprints intro to lighting to materials. We basically have the entire set of classes for you just to learn and get up to speed.
Chris Nichols	That's great. That's great. Well, cool. Well, thank you so much Juan. I really appreciate you coming by and telling us about this because I think it's going to be really great for people to do that and to learn some of this new cool stuff, alright? Thanks man.
Juan Gomez	Yeah, bro. Thank you so much. It is fun to be here with you.
Chris Nichols	Yeah.