IAN MCROBBIE: I'm just going to be demonstrating some of the ways that we achieve these tasks. I'm not saying that these are the best ways, there are the most efficient ways. These are just the ways that we've-- tried and true, these have worked for us.

And maybe they work for you, hopefully. Even if you can't utilize these methods in your workflow, you'll at least learn some different aspects throughout the program that you can use in other ways to improve your own visualizations.

My name is Ian. I have a degree in game art and design. And I'm obviously-- I'm not making video games. And that's because partway through my degree plan, I decided I didn't want to make video games anymore. But what the degree plan offered me was a deep knowledge of 3ds Max.

So I knew how to model. I knew how to texture. I knew how to animate in 3D. I learned all these things. And they dovetailed very nicely into what I do now, which is I create visualizations for RS&H, and have been for five years, which is an AC firm specializing in the transportation, health and science, defense, corporate, aviation, and the aerospace industries.

And that's enough about me. How about the work that I do? Why should you listen to me? What can I offer you? So here's a quick demo reel of our most recent work.

[VIDEO PLAYBACK]

[MUSIC PLAYING]

[END PLAYBACK]

So there's a bit of what we do. So we have a lot of experience, many years of experience, creating large roadway visualizations and other things, but primarily, large roadway visualizations for many years.

I've been at RS&H creating these for about five years. My colleague has been there for about 10 years. So we have a lot of experience making large roadway projects in 3ds Max.

And to start, we'll discuss the large bitmap aerials that end up in our 3ds Max scenes. And by

a show of hands, who's tried to put a JPEG texture file into Max that was just too big? And what happens to Max? It acts real sluggish. Sometimes, it'll crash.

And then if you add-- if you start using the low-resolution textures, on the other side of that, then Max likes to move nice and smooth. It's less likely to crash. But low-resolution aerial textures can look really cruddy, and they look muddy and blurred. And you lose a lot of detail.

So the best-case scenario would be able to incorporate those high-resolution aerials where we need them and only where we need them, and have low-resolution aerial outside of that area where we don't need the camera focusing in on those areas.

So to start that, when we need to start a project, we need to determine the full extents our aerial will need to extend-- what square mileage or whatever dimensions that we're working with. Usually, it's mileage for these large roadway projects.

And so we identify the absolute maximum amount of aerial texture that we'll need. Let's just say for most fly-through animations, the camera's going to see bits of the design that we want to focus on. But it's also out in the periphery-- it's going to see these areas that don't need as much detail.

So after we have a bitmap that's of a lower resolution established that's our full extents, we can start identifying our focus areas where we're going to need more of a high-resolution texture where the camera's going to see those up close. So for example, I have this.

This will be my full-extent aerial for this example. And if you can't determine where this is, you are here. This is the area surrounding the Venetian hotel. And just say theoretically, we want to have a fly-through animation that goes from that north interchange down I-15, makes a left, makes another left, and then goes up that road and settles on the Venetian hotel itself.

So now we can identify the areas where we're going to need a bit more high-resolution aerial. And what we tend to do in those areas is break them up into congruence square high-resolution textures. And the reason we do that is because it's really easy to ask our CAD people to give us-- from AutoCAD or MicroStation give us a fence of the design that is 2,000 feet by 2,000 feet square. And then they can give us that. And then we can go into Max and identify the areas where we're going to need those high-resolution aerial images.

So now that we've set up our high-resolution area, I'll show you that in Max. So to start with,

we've got our first high-resolution aerial. And we want to make sure it looks real good up close because the camera's going to be near there. So just for example, that looks pretty good.

And of course, it looks better the further out you get. So we start building our high-resolution grid, basically. And then behind that, we stick our lower res aerial image. It's that original full-extent image. And we stick that about a foot below these high-resolution aerials.

And what that does is if you get really up close, it's really easy to identify where the high-resolution and the low-resolution is. But you pull back even just a little bit, and it becomes increasingly difficult to see where that line is. But that line is right here. So if you know where that limit is, you can identify it. But if you don't, you'd never even notice.

So what we've done is we've conserved memory by getting high-resolution aerials where we needed them, and not where we didn't.

AUDIENCE: [INAUDIBLE]

IAN MCROBBIE: It depends. It depends on what our camera's going to do. For this example, this was 2,000 feet by 2,000 feet.

AUDIENCE: [INAUDIBLE]

IAN MCROBBIE: Right.

AUDIENCE: [INAUDIBLE]

IAN MCROBBIE: So in summary, determine the extent that you need. Get a very large, as far as square mileage goes, image at a low resolution because you don't need it to be high-resolution. And then identify your focus areas and capture high-resolution aerial images for those areas.

And then you can have-- combine them in Max. And then you could see what your camera sees. Do you need to add some more high-resolution squares, or can you take out some?

And if you've got more than you need, you could take out some and you can conserve memory. And it just makes Max much happier. Yes?

AUDIENCE: If you wanted to really go for efficiency-- and I don't know if I'm getting ahead of the presentation here-- could you also modify your model so that as it created the animation, each

of those squares to turn off and on--

IAN MCROBBIE: Sure.

AUDIENCE: [INAUDIBLE] keeping them all on the same time?

IAN MCROBBIE: I would love to be able

To do that. But we don't have a coder on staff. I'm sure someone with Max script knowledge could do that. But ourselves-- we don't.

AUDIENCE: And one thing we found, too, is that it's not always what is seen that bogs down Max, it's what's [INAUDIBLE], what's in the file.

IAN MCROBBIE: Yeah. You get animated traffic in there. You get thousands of vehicles that are all animated. And it's that animation information that's-- bogs Max down a lot, too.

Next, we have the raster and vector images. And it's possible to get vector images into Max. Not everybody knows that. I think it's a fairly new feature. Actually, we've only been experimenting with it for maybe a year. So it's new to our workflow.

And just a refresher-- raster images you're all familiar with-- are JPEG, PNGs, TIFs. And they're composed of colored pixels, which means that if you zoom in, if you zoom in too far, you start to see those blocky pixels. And it starts to look blurry and cruddy.

But vector images are math-based. PDF can contain vector images. EPS and Adobe Illustrator files are some examples of vector images. And they are constructed by the machine out of points and paths and fills so that when you zoom into a vector image, it stays nice and smooth and crisp.

AUDIENCE: [INAUDIBLE] magic.

IAN MCROBBIE: Technical magic. So I'm going to demonstrate. So right here, we've got this aerial. And we've got all of the pavement markings in this JPEG image, which means it will look fine up to a certain point as you zoom into it. It looks pretty good from there-- maybe a little thick on some spots. But when we zoom in, it starts to look really blurry and smudged and not what we want.

So how do we get vector images onto our aerial? Well, first, we want to create an aerial that doesn't have the striping in it, like so. And then from there, in the Material Editor, if it opens,

I've got this composite material already built. But let's build it from scratch.

AUDIENCE: [INAUDIBLE]

IAN MCROBBIE: That was a proposed road. Yes.

AUDIENCE: [INAUDIBLE]

IAN MCROBBIE: Yeah. Yeah, like Photoshopping out traffic out of an existing area. So what I've got, it's-- I've got that aerial texture that I just showed. It doesn't have any striping in it. And I've put it into a composite material into its base slot.

And the composite material can be found right up here in the Standard Materials. And you drop that in. And it already has something filled into the base. But you can just drag something else in there and delete out that guy.

But since we've already got one going-- so we have this aerial already set up. Next, we want to make another material that's going to be our white striping, our white pavement markings. It can be any sort of material, standard or V-Ray material. I'm using standard in this example.

And that's going to plug into Material 1. And what composite materials do is that they have a base material. And then everything that goes into the materials after the base are basically stacking up on top of that base material.

AUDIENCE: [INAUDIBLE]

IAN MCROBBIE: Right. That's exactly right. And what I've got here-- let's see-- I've got these vector striping files, which are the exact same extents of the aerial that I'm going to drop them onto. These came from AutoCAD-- and then edited in Adobe Illustrator to get the thickness right.

And as you can see, this is a vector image. So it looks nice and crisp, even when we're really up close to it. And it's black and white because the method that I'm going to show, it doesn't matter what color the vector file is. And I'll show you why.

I'm going to grab a map. I'm going to grab a vector map. And inside that vector map, I'm going to put my white striping file. And I'm going to drop that into my opacity map.

So now, the only thing that's determining the color of the vector map is this material's color. So I'm going to make that guy all the way white for white striping.

And my vector map-- I want it to have some transparency. I want its background to be invisible. So in this vector map settings, I'm going to go in. And where it says Alpha Source, it says None right now. But I'll fill it into the image alpha.

Now, the stuff that came out of MicroStation, in this case-- it's-- all the striping is one thing. And then its background is totally separate. So it already has an image alpha built into it. So I can use its image alpha right here to show [INAUDIBLE] and get a nice, crisp striping.

And let's do-- I'm going to copy this guy for my yellow striping because I have a separate PDF of yellow striping. So I'll make this guy a yellowy, stripey color. And I'll replace the vector map it's using with a yellow one.

So now we can-- using these composite materials, we can combine these raster images, which we need to have the aerial in most cases. So we get our nice, concrete textures and stuff.

AUDIENCE: [INAUDIBLE]

IAN MCROBBIE: Most of the time, it updates automatically. Every once in a while, you'll need to go in. Like any texture in Max, sometimes it just won't update. But most of the time, it updates without you having to do anything.

AUDIENCE: [INAUDIBLE]

IAN MCROBBIE: Yeah. That's something we haven't tried. It's theoretically possible.

AUDIENCE: [INAUDIBLE]

IAN MCROBBIE: Yeah. That seems to mesh with what I've done.

AUDIENCE: And I guess it kind of depends on the style because those aerials have so much texture to them, you want to preserve a lot of that grid [INAUDIBLE].

IAN MCROBBIE: Well, as can be seen, we can get that real sharp, crisp pavement marking really, really sharp-looking, even when the camera is really close. But one of the limitations that we found experimenting with this is that the further away from the camera the vector map goes, it kind of

starts to distort, which depending on what your camera's doing-- if the camera is getting real low to the ground, so it's a real flat angle or a curve, when things get towards the end of the frame, the edge of the frame, they can start to blur, even the vector.

But this can be remedied somewhat by just upping the resolution of your render. Right now, I'm at 720. If I up it to 1,080, you could see it starts to dissolve a little bit, but it's much better.

AUDIENCE: [INAUDIBLE]

IAN MCROBBIE: Yes. Yeah. It's got these filter result and MIP mapping.

AUDIENCE: I've never used vector. I've used the bitmaps. And they got some area--

IAN MCROBBIE: Right. Yeah. So the vector maps have these. And changing these will change the result a little bit. But I've found that keeping them both on is-- will give you the best result.

So in summary, to get vector images on top of your bitmap aerials, the method that I've shown here is to create a composite material and then put your aerial in the base slot, and then putting your striping-- PDFs or whatever vector format you're using-- into the materials on top. And it will stack those on top of your base material.

AUDIENCE: [INAUDIBLE]

IAN MCROBBIE: Yep. You could use it for anything. And the beauty part-- well, not the beauty part, but using them the way that I have here with the vector maps plugged into the Opacity slot is the result of-- and previously, we've plugged the vector map into the Diffuse slot. And it's given us weird halos around every individual pavement mark, which-- no dice.

But if you pump it into the Opacity slot and then use this material's diffuse color to control the color of the striping, then you don't get a halo. And you get real fine control over what those vector maps appear as.

This aerial isn't super high-resolution. It looks really grainy. But we found that sometimes, just having some sharp-looking striping can elevate the whole visualization. So you don't necessarily need to have a high-resolution aerial. [INAUDIBLE] have a good look and visualization.

Now, switching gears to-- question? Switching gears to--

AUDIENCE: [INAUDIBLE]

IAN MCROBBIE: Yes. Yeah. It drapes. But it's possible to run into that issue where if it takes on the right angle, if it gets a little too flat from the camera's point of view, it may start to blur the vector map. And so you could pump up the render resolution. And it will help that.

But you can't render, like, a 4,000-frame animation at 700-- so it's a balance. You got to see. It all depends on what your camera's doing, how close to the ground it's getting, the angles it's viewing the scene at. It's some trial and error.

AUDIENCE: [INAUDIBLE]

IAN MCROBBIE: Well, we get all of our design files cropped to that same fence so that everything is in scale relative to everything else. And then, as I said earlier, that arrow that we had was 2,000 feet by 2,000 feet. So when we drop those images in, we know exactly the size that they should be to be perfectly in scale.

And if we need to edit the striping in Illustrator, we-- Illustrator-- you can't get exact measurements for your line widths and stuff. So you kind of have to eyeball it. And sometimes, it helps to bring in, like, a six inch wide reference piece of geometry into Max. And then you can eyeball it.

And these vector files-- they're so easy to work with in Illustrator and they save so quickly that it's not a big deal if you've got to move stuff up and down a little bit.

Who here has used XREFs? And has your opinion of XREFs-- is it good or bad? All right. I'm just speaking from our personal experience.

We could see the value in using XREFs. But just depending on your workflow-- for our workflow, things can get kind of hairy towards the end of a project when lots of changes need to happen to multiple files and opening and closing a whole bunch of files. And it's easy to lose track of what's going on.

So if you are familiar with XREFs, they allow multiple users to work on different aspects of the same scene. And then there's another file that basically combines all those disparate elements into one scene.

AUDIENCE: [INAUDIBLE]

IAN MCROBBIE: Oh, yeah?

AUDIENCE: [INAUDIBLE]

IAN MCROBBIE: So with that said, it sounds like they work exactly like they do in 3ds Max.

AUDIENCE: [INAUDIBLE]

IAN MCROBBIE: Yeah. So what that means is once it's XREFed into a scene, it can't be edited. It can't be changed within the scene that it's been XREFed into. You need to go back to its original file and edit it.

And what that means is if there's a time crunch or the person who's been responsible for that aspect of the model is nowhere to be found or whatever, you can't edit that aspect of the model within the scene that has all the XREFs in it without merging them in. And then you kind of lose the usability of XREFs.

So editing scenes, especially what we've found-- editing scenes can be a real chore if-- because we don't have access to all the files. We don't have the ability to edit everything all at once because at the end of a production cycle, stuff needs to happen really, really quickly without having to open up a whole bunch of files.

So what we tend to do is incorporate XREFs early in our production. And then as we get towards the end of the production, we merge in all those XREFs so that we have real quick control at the end, towards the end of the project.

Now, geometry for post-production-- what does that mean? In this example, the geometry that was created were all three of these highlights, the two orange highlights and the blue highlight. These were all modeled in Max as separate objects and rendered separately, and then brought into After Effects, which is a video editing program. And then the color and transparency was all decided within After Effects.

So the method that we use for creating these easily usable pieces of geometry in After Effects is-- for example, let's say I wanted to highlight this northbound road. What I would do is-- it's like what we did in that example I just showed-- is I create a piece of geometry that covers the area that I want to be highlighting in post-production.

And then what makes it quick and easy is the material that we're going to apply to it, which will be a standard material. You can make it any color you want. I like to make them bright white so they're easy to see and then bump up its self-illumination to 100%, which means it's going to be lit evenly. So no matter if it's curving around or if it's a straight line, it's not going to have any variation in its color.

And then it's rendered out. You can isolate it in Max. So if we want to render this highlight, we would set our key frames and then hit Render. And it's really easy to see because it's self-illuminated.

And it's really easy to get a ping sequence of these and drop it into After Effects. And you get full control over the color, the transparency, and how they reveal themselves with masks in After Effects.

AUDIENCE: [INAUDIBLE]

IAN MCROBBIE: Adobe After Effects. Yes, sir.

AUDIENCE: Instead of isolating [INAUDIBLE] usually referred to apply the [INAUDIBLE] material on everything else. That way, you can get the layers if there's any overlapping.

IAN MCROBBIE: Right. Yeah. We use that, too. It just depends on what it needs to interact with in 3D.

AUDIENCE: Yeah, you always have to create an entirely new scene for that [INAUDIBLE].

IAN MCROBBIE: Which we have. Yeah. We've had duplicate models. We had one giant model. And then we have-- we copied that model, turned everything to a matte material so it wouldn't be renderable, and then create all of our highlight shapes in that. So whenever we render from that, you'd see the highlight shapes. And you'd see the highlight shapes break when they went under a bridge or through a car.

AUDIENCE: Presuming that you use this [INAUDIBLE].

IAN MCROBBIE: Yes. You could. What we mainly use it for is once our roadway geometry is built up, we can actually just copy that top layer of roadway-- that it's already got the curve and slope to it. And so we duplicate that and then apply this material to it.

AUDIENCE: You're saying if it's just a bitmap as opposed to geometry--

[INTERPOSING VOICES]

AUDIENCE: [INAUDIBLE]

IAN MCROBBIE: Yeah. Because these render so fast in-- with the Default Scanline Renderer, we break them all out and do their own individual things. So we have total control over animating each one on its own because even when we think we're cool and we can render a few of them at the same time, we get them into After Effects. And inevitably, it ends up being-- the mask doesn't want to move right or it's revealing the wrong part of the highlight at the wrong time. So it's quick and easy to render them all individually.

And summarize that-- for highlights, we create simple shapes, apply a standard material, make sure that material is set to 100% self-illumination, and then render using the Default Scanline Renderer because it's really, really fast. And you can go through thousands and thousands of frames of highlights very, very quickly-- in, like, no time.

And I guess I can open it up for questions-- got any more questions?

AUDIENCE: So how many of your-- what are you porting in from [INAUDIBLE]?

IAN MCROBBIE: More often than not, we hand-build it in Max. We make sure we get our design files delivered to us broken out into the precise way that we want so that it's really easily editable. Whether it's filled shapes or closed shapes or open shapes, we specify that so that we can edit it in Photoshop or Illustrator, whatever it may be, very easily.

AUDIENCE: [INAUDIBLE]

IAN MCROBBIE: Yeah. Absolutely.

AUDIENCE: We're seeing more and more stuff [INAUDIBLE]. But then for [INAUDIBLE], you got [INAUDIBLE]. But what we find-- hopefully that changes next year, but before we get that geometry, it's just a mess. And it doesn't render very well. And it doesn't tie in the surrounding geometry so we usually end up remodeling it as we're trying [INAUDIBLE].

IAN MCROBBIE: Yeah.

AUDIENCE: Hopefully, one day it'll all-- [INAUDIBLE]

IAN MCROBBIE: Yeah. And it's a little easier if we're just working with a terrain file so-- because the details aren't as important. We can retopologize that geometry to make it simpler. And once you've got an aerial texture on top of it, it's like a lot of those peaks and valleys of the terrain start to disappear, anyway.

So when we get terrain files, we will break them down a whole bunch, or we simplify them a whole bunch. And they still get the point across.

AUDIENCE: Real quick, [INAUDIBLE] we haven't done it in a while, but some of those terrain files are so ugly, the geometry, we've even taken a grid and turned it onto a cloth and just simulated [INAUDIBLE]

AUDIENCE: [INAUDIBLE]

IAN MCROBBIE: Luckily, most of our roadway projects that we work on are all in Florida, which is very flat. So most of the time, we don't even need to take the terrain into consideration for berms and things. We just can pop those up easily ourselves.