MARK KAUFFMAN: OK. We'll get started here in about two minutes. I'll just give you about two minutes. I'm just re-booting my laptop-- brand new machine, love this thing. Got two weeks ago and there's something wrong with it and I can't quite figured out. It's fine, it's fine, and it locks. And not just an application crashes, the entire OS locks up. I thought, well, maybe it's a driver or something, so I uninstall window-- actually not uninstall, you can't do that-- but wiped the hard drive completely, install-- and we run Windows 7 Enterprise in our organization-- so I put that on there anyways as opposed to the stock HP Image.

And during the actual booting off the DVD and starting the whole process, it locks up. I'm thinking, this is really bizarre. So I get it installed, and get it updated. You know how long that takes. Because I'm starting with an SP1 installer and then it's got to go through all those updates to get you up to. I finally get that done-- everything. I'm almost ready to roll it into the date domain and it starts locking up like crazy. I thought, I'm just going to try it, so I installed Windows 10 on it. It's running fantastic with that laptop. And it starts locking up. And I'm thinking, OK, this is only three days old and I'm having all these wonky problems, why is it me? I don't understand.

So I hand it off to our IT person, because I don't have time to troubleshoot too much. And he talks to HP. And he says, oh well, it's been running fine for us, but-- what is he doing? He's just sitting there and just kind of moving the mouse around. Well [AUDIO OUT] application, like your office applications, your rd application-- is he actually sit down and doing any of that? No he's not, because he's an IT guy, that's not his job to use the laptop in that respect.

So they do a couple things. And he says, it seems to be working fine for me. I get it back and it actually seems to be going pretty good for the day. And then what happens over Thanksgiving? Locks up. Yeah, wonderful!

So I ended up just do a little troubleshooting myself. Actually pulled the battery, pulled the little bios battery that's on the inside-- luckily these new HP's have those release bottoms so you can just slide them off, you don't have to get the tools out. Pull that. And it's been fantastic since Sunday this week. It's been great. Then this morning? Lock up.

So in fact, just a minute ago I had to re-boot it. Hopefully, it's going to be good. So we'll just say, good laptop, you're very good boy, girl, person, machine. Excellent. OK.

So I'll go ahead and get started here. Thanks for coming to the class. This is creating 3D Model Assets for InfraWorks. My name is Mark Kauffman, I'm the Technical Lead of Project Visualization for WSP Parsons Brinckerhoff. I've been doing InfraWorks since day one. In fact when it was project Galileo-- I want to say it was even a project "something" before that, when it was Infrastructure Modeler.

And started working with that. Was in the labs, kind of migrated eventually over to InfraWorks, their new re-branding. And I actually get a chance to work with the Sandbox. And I don't say anything more than that, just look it up on the web you can find it.

Who here was in David Lawrence's class yesterday about InfraWorks? I saw you there. His workflow is dealing a lot with getting stuff from InfraWorks to Civil 3D and back. My question for you guys is, how many of you are InfraWorks users, obviously? Most you, OK. How many are 3ds Max users? Revit? SketchUp, that other application?

So most of you are dealing with applications where you're generating content for InfraWorks. Now, if you've worked with InfraWorks, while it's a nice application, we can all agree that the library is less than stellar. So the street furniture, as they call it, there's some trees, there some people, and some cars, and that Alfa-Romeo looks kind of scary, that kind of stuff. So the idea is that you want to be able to build your own assets.

So when I came up this class idea-- and this is right about the time that we were dealing with the California High Speed Rail. And we end up using InfraWorks as part of the pursuit process. And they said, oh well, can we go through and build a high speed rail guide way with centenary lines, all this. I'm thinking, I can't really do that, you'd have to build it in a separate program, like 3ds Max, or MicroStation, or whatever. You have to import it as this giant thing.

But think about it, I've got a corridor that's 20-30 miles along. To build a piece of geometry that goes that far, I don't think so. Wouldn't it be nice just to have a line that's a road, or as a rail and do that?

So I did a little research on it at the time. I had the opportunity to check out some new techniques. But the other whole thing came up of OK, well-- if you've used InfraWorks, you know what a decoration is. Anybody here not know what a decoration is? Good.

So you can add decorations on your roads, and your rail lines, and stuff. Well how do you get that actual content in? And the whole process of getting the content into InfraWorks, there's a

couple of things you had to learn ahead of time. And there was a little bit about the formats that you were exchanging between InfraWorks your program. And again, this class is going to focus primarily on 3ds Max, primarily because that's my application of choice.

The techniques we're going to learn transcend 3ds Max. It could be a Maya, could be a SketchUp, a Rhino or whatever you're dealing with. But we will talk about the different file formats to work with. We'll talk about the different image file formats that you work with for your assets. So what kind of maps you use, what map channels are supported. As well as what scales you have to work with to make sure everything works. And we'll also get a chance to look at building some custom road systems.

Now, you probably have looked at this. I'm not going to go through the Class Summary. Little bit about what's going on, we're going to cover pretty much most of that. We've got about an hour and a half. Kind of what you're going to be learning towards the end of this class.

So there's a couple of ground rules that we need to look at as far as dealing with-- and what I mean by ground rules are elements about your production that are either limitations or methods that you have to follow in order to be able to get content from your digital content creation program-- 3ds Max, Maya, SketchUp, et cetera-- over to InfraWorks.

And one of the first ones is this whole thing with Scale. I guess I didn't set that up right. The first one is scale. Now when I talk about scale, while you can work in feet, and you work in inches, and you could work in centimeters and millimeters-- in my experience, whenever you create your content if you work in say, feet, you bring it in as an asset. So a 3D model asset into InfraWorks, it's not scale properly. It thinks that the units are meters, it always wants to bring everything in meters.

So whatever you're working in, always start working in meters. So in SketchUp when you could first create your template, you can select the meters template. In Max, you set your system unit. If you're using the newer version of 3ds Max, you can create templates. Same thing with any of your other digital content creation applications.

The second one, no 3rd party renderers. And what I mean by that is, if you're a 3ds Max user like me, I use V-Ray as my render engine. So if you build all your assets-- and we have a whole library that we work with in project visualization that has all of our cars, and our people, and our trees-- and they're all built either as Vray proxies or they're raw 3ds Max elements, but they all have Vray materials on them.

Now you can imagine while it looks great in Vray, you send it over to InfraWorks and it says, I have no idea what this is. I don't know what this material channel is. In fact a lot of times, I use FBX as my primary export format. And it'll say, what kind of file format? I don't understand that. It's an unknown material, so it doesn't come out.

So whatever you're working with you want to use the stock [? Fong ?] blend standard material system that ships with your 3D application. So in 3ds Max it's a standard material. Just a stock material that you work with in SketchUp will work. Same thing with Maya, stock Maya material will work. And so on and so forth.

In this class we'll get a chance to look at a methodology that I-- oh, yes? Please.

AUDIENCE: Up there it says no third party materials, but then you specifically mentioned your render, using third party renders. [INAUDIBLE] pulling in your own custom materials on objects and then [INAUDIBLE].

MARK KAUFFMAN: Yeah we will. No, that's a great question. By the way if you have questions at any point in time, please stop and raise your hand and ask the question. So the question is, I'm talking about third party renderers and materials. Most third party renderers-- so to take Mental Ray and Vray, I'll use 3ds Max here-- while you can use a standard material with Vray, most of the time you're going to use a Vray material, a specific one. Or if you're working with Mental Ray, you're going to work with an arc and design material, which is stock inside of 3ds Max. However when you export to FBX, you're going to get a warning to say, this is an undetected type of material.

We'll also talk specifically about what types of textures, or shaders, are supported within even the standard material. Does that answer your question a little bit better? OK. Good.

So we'll talk a little bit about bitmap types. Now, bitmap types-- there are several types to work with. And you can bring them into InfraWorks and you can support pretty much everything here, so TGAs, JPGs, BMPs, TIFs, and PNGs. My recommendation is this, stick with two, if you can possibly do it, and one primarily.

First of all JPGs are fine, but JPGs are compressed images. And unless they're saved at the highest quality setting, you're going to lose some quality in the image. There's another disadvantage to JPG and that is it doesn't supporting any alpha channels. Anybody not know

what an alpha channel is? Good.

TGAs support alpha channels, so do BMPS more or less. It's better to think that while BMPs technically could support an alpha channel, don't use an alpha channel with BMPs. TIFs and PNGs, on the other hand, support alpha channels and they also support transparency. That can lead to some potential problems, we will take a look at those as well.

But one of the advantages-- and this is our particular workflow on project [? Biz, ?] but I was recommend this is-- if you're going to use any kind of imagery for your bitmap libraries that you used to assign materials, it's usually best to use a PNG. The nice thing about a PNG is first of all, it's a lossless compression format. TIF is kind of the same thing. You can support alpha channels, you can support transparency, higher bit depths.

The most important thing though is-- probably the majority of you are working in Windows. And when you see Windows-- looking at icons-- and you want to build a library of-- OK, there's all these maps called, concrete one, concrete two, concrete three. You can just go ahead and say, I want to view it as a thumbnail, large or extra large. Well if it's a TGA, it's going to go, I don't want this is. It's going to pop up a little windows icon to say, this is a file, that's a TGA. I don't know what it is I can't read it.

With JPGs, and TIFs, and PNGs, natively windows can support that, so you can go ahead and view them as a thumbnail. Now, Windows is smart enough to also create a little bitmap cache file inside the file folder whenever you go through and generator thumbnails. So you generate them once and then-- hopefully, when you go back to that folder again and you say, show me the extra large icons, it'll just populate them really quick. You won't have to go through and write them, which is easy on your local hard drive, but if you go to a network drive and you've got 500 images in a folder, you're sitting there waiting and wake. I recommend the TIF and the PNG format as your primary formats for your bitmaps that you use on your textures.

Now the next thing, I want to talk a little bit about the formats and part of the ground rules. There's really three formats that you want to use it in InfraWorks. Now, while you can support some other kinds of 3d files, for the most part these are the ones you want to work with.

The first two on the ones you primarily want to work with. And we're going to go through each one of these. It's really great, I get a chance to work with the development team for InfraWorks. They had an intern in there and he set out a document-- because they knew that I was dealing a lot with this-- back in the day, InfraWorks when it was Infrastructure Modeler,

can support one material channel and that was diffuse. And so you had to texture, but you couldn't do normals, and you couldn't do bumps, and you could do specularity, and other things like that.

Well, they had him and go through and prepare this long document. And I ended up using some of the stuff and I will give credit to him here-- I do in my document-- for really going through and examining every single format. I had a chance do this myself and ran into a couple of bugs. It's always nice about doing these classes, it's like, it's supposed to-- it doesn't work there, oh! There's another bug I can log! Good.

All right. So the three I have here OBJ, FBX, and DAE. Anybody not know what DAE is? OK, COLLADA.

Now, what's important about these three formats is-- this is the one is I primarily use most of the time, FBX. OBJ is actually a really good format for exchange. In fact, a lot of higher end digital content creation programs, that's like the go-to format. FBX is nice. It's an Autodesk stuff. It was based originally on film box. It can support a lot of bringing stuff from say, 3ds Max to Maya without skipping a beat, but also other applications. COLLADA is-- there's one very good advantage to COLLADA, otherwise I do not recommend it as your standard support format.

COLLADA is one of those open source formats that was really great. They talked about it, it was supposed to be open and wonderful. And it never really went anywhere from there. The nice thing about COLLADA is they support animation, whereas OBJ and FBX do not support animation. We'll get a chance to look at that a little bit later. You can do 3ds and some others. Don't even bother with it, just stick with those three. Yes, question?

AUDIENCE: I've been using DAE, COLLADA, stuff for SketchUp and there's a lot of question into [INAUDIBLE] Have you seen that?

MARK KAUFFMAN: Yes I have. And Autodesk, interesting in Max, they support an Autodesk DAE, which is using the COLLADA format to export. It makes these gigantic inefficient files. I think it's one of those situations-- you know it's funny with lots of software companies, they're always going to want to promote their proprietary formats even if they are somewhat more open format, like FBX. COLLADA they've kind of just let things slide off to the side. They're hoping everybody will adopt FBX. And SketchUp its kind of the opposite there, they don't want to adapt any FBX capabilities.

AUDIENCE: [INAUDIBLE]

MARK KAUFFMAN: Exactly. So they don't want to compete. They don't want to make it easy to work. My philosophy is, it doesn't matter what your program is, it does what you need it to do and you're happy with that workflow. I think you should do everything possible to say, if you're SketchUp user-- and believe me for modeling buildings, SketchUp is the bomb. You can just bang out buildings. One of our guys uses SketchUp exclusively and he can model context buildings like crazy in SketchUp. But then we can open up the SketchUp file in Max integrate it into our visualizations. And we're all happy campers. If we have to do any really intricate modeling that is more difficult to do with SketchUp, then we do it in Max. But it doesn't really matter. The most important thing is we have multiple applications.

Yesterday when I was in Dave Lawrence's class, he was saying, who here would want to program that does everything? Nobody raised their hand. They don't want this program, this giant, beastly, monster from hell that does everything. It's kind of hard to do that, each program has its specialties. So I get off my soapbox here about that. So moving on.

And of course animation. If you're going to support it, you have to use a COLLADA format. And we'll talk specifically about what is supported. So for instance-- well, we'll get more into it-- but, you can support very rudimentary animation, but nothing complex like deformed meshes and morph target. So in other words, you can't do point cash people walking around. Won't work.

So a little bit about material channels. Now it sounds like most of you understand a lot of the stuff, so we'll kind of breeze through it and spend more time working on-- what are the specifics about the workflows that we bring to this class, that I bring to this class. And not worry about, do you know what a diffuse channel is and an opacity channel? But we will talk about the idiosyncrasies about those going between your different DCC applications.

So of course with material channels InfraWorks will support four primary material channels. The diffuse, which it already has. An example here. Has anybody used Substance before? Anybody not know what Substance is? Raise your hand. OK. If you run 3ds Max, there's a shader that you can go in and select for your diffuse or whatever, and it's called Substance.

Substance is a small little file and it's made by company out of France, called Allegorithmic. They make some great tools. But it's a shader file that explains, hey, here's a brick texture and

it will not only do this procedural brick texture, but it will also spit out a normal map, a diffuse channel, a specular channel, and everything for you. You can load it into 3ds Max. And if you go into the schematic material editor-- and maybe we'll take a look at this a little bit later, a little bit beyond the scope of this class. But you can use a Substance material to spit out this stuff. And it's great.

And then there's this free application, called the Substance Player. You have to buy the shaders. And they ship a couple of free ones with 3ds Max, and Maya, and so on, and so forth. But you can buy more from them and you can modify the shader. So if it's a brick or concrete, you can change the color of it, the attributes of it. Is it more distressed? Is it like brand new concrete? If it's this type of wall pattern or things like that. And you can generate all additional map channels out of it. If we get some time, I'll show you that if we can. But it's a great tool and that's what I actually used to generate that little image. So that's just an image of ivy on a wall. So in this case we have a diffuse channel.

The opacity channel. Because of the ivy, it's meant to be-- I want to place it onto a surface, like it's crawling up the wall. And so the white areas are completely opaque and the black areas are completely transparent. And anything in varying levels of gray and it creates varying levels of transparency. So it's gray, it's going to be semi-transparent. If it's black, it's completely transparent. White, it's completely opaque.

The other thing it'll support is specular. This project here will not show the specular channel, because it's barely there. But specularity, for this particular one in Substance said, OK, these are leaves. And leaves have a little bit of specular highlight, they're not really overly glossy, but they have a little bit of a sheen to them when you look at the leaves. So if you could see that better, you'd see it.

And then finally a bump and normal. Now what's interesting about InfraWorks is it supports both bump and normal maps. So if you use a bump map in your DCC application, just a grayscale image-- and that's just white is the highest points, black is the troughs, and gray is like the zero point. White is one and black is negative one if you use like a height information.

Normal maps are RGB-based bump maps shall we say. But instead of just showing heights data, it's using height and 3D spatial information to explain that surface. And with lots of real time shading systems-- and that's essentially what InfraWorks uses to be able to show bumpiness-- you can get a lot more details. Let's say you have a retaining wall that has a very

distinctive interlocking stone pattern on it, you can do a normal map out of that. And instead of looking like just a flat surface, like you see over here on the wall, you can see that bumpiness depending on where you are. And it'll actually shade based on the sun and other things like that. It's much more robust than a bump map, but the nice thing about it is that it will support both.

It's interesting. When I found this out, I was running and testing the beta version of InfraWorks about two years ago. And I had loaded up an old model for the Los Angeles airport that we had. And it had bump maps and it was built in 2006, so it didn't have any normal maps or anything. And I just loaded the geometry in there, because I needed it for my scene. I'm like, wow, that building looks interesting. Because I had a bump map on the roof to show gravel that they'll put on the tops of roofs and whatnot. Then I got down, I'm like yay! It supports bump maps! And at that point it also supported specularity and some other things. I went to town from there. So it was really nice.

So those are the four channels that you could support out of your DCC application into InfraWorks. Nothing else. You can't support-- and we'll talk about each one of those and what the limitations are. But some other things come into play like, do you support ambient occlusion? And all this other. No, it doesn't support that.

So I came up with a little chart about or your different bitmap types and specifically what they will and will not support. So this is kind of the whole thing. One of the reasons why I suggested PNG and TIF is because PNG and TIF support everything. In fact in this chart, you'll see that, yeah TGA will support the RGB data, it will support the alpha data, but it won't support transparency. So in other words, if you have alpha channel on a TGA, InfraWorks will just ignore it. It just doesn't care. With a PNG on the other hand, it supports both the RGB, the alpha, and transparency data.

Does anyone understand what the difference between transparency and alpha is? Who here's worked with Photoshop? Hopefully everybody. OK. So when you go to Photoshop, you have an image on the screen. And let's say it's my hand. And it's just standing out there and it's got a black background on it. Well, what you can do is select all the black background and knock it out. So there's this gray and white checkerboard area, it's transparency. And alpha channel says, I want a black and white map that explains the cut out, the mask, around my hand here.

But transparency goes one step further. It's kind of a quick way of doing a layering system

inside Photoshop. So both PNGs and TIFs support transparency information. JPGs do support RGB, no alpha and no transparency. BMP maps technically can support alpha channels, it doesn't quite work with InfraWorks.

So this is why again I selected those two primary formats. One because Windows see them and generate thumbnail icons. Two, because they're a lossless compression format. And three, InfraWorks can support all of that there. Any questions so far? Good.

So the next thing is-- this is kind of an interesting chart. I provided this inside the document. And this is an important thing. So you've got all these different materials and you want to see OK, well I want to use FBX, or do I use OBJ? Or do I use COLLADA? Well, this chart kind of goes through.

And this is from that intern I told you that was Autodesk. He actually built this for me. And I got to tell you, it's really nice to have someone go through and test a lot of this. Although I found a couple of issues. So basically, this chart is-- wrong button, sorry. So this chart is broken down by material settings.

So what I mean by no settings, or no textures is, I have materials-- Inside 3ds Max, you have a diffuse channel and it can have a simple color to it. You also have the ability to have a specular channel, a specular color channel, a specular level, a gloss level, a self illumination, and a self illumination color. We'll take a look at that here shortly in 3ds Max.

Now, a lot of your digital content creation programs-- so if you have a standard phong, or blend type shader system, which most of the stock 3D materials have that, you're going to have these capabilities. That's what it's talking about here. So just simple colors.

So for instance, OBJ, FBX, and COLLADA all support defuse. All of them support specular color, specular level. Glossy level is not supported in OBJ, but is supported in FBX and not COLLADA. And you kind of go through. So you can see, if you want to do any self illumination, which is great-- hey, I've got this lamp and it's got a light globe in there. And I want it to be illuminated, it may not generate any light in InfraWorks. [AUDIO OUT] When you have the sun go down, wouldn't it be nice to have lights on a bridge or something like that? Well, low and behold, InfraWorks doesn't support that.

We go a little bit further and we have texture types. So textures would be your shaders, or your textures, that you plug into the diffuse channel. So in the case of that ivy before, that's the

bitmap that you plugged in to make it look like ivy. So OBJ supports defuse. All of them support diffuse. Specular level does not support, does not support, does not support. This is interesting.

So I started working with this. And it's interesting because OBJ is the only one that supports a specular map. But we'll see how you run into some problems with the specular coloring, glossiness, and whatnot. And we'll take a look at that. It's almost like FBX is better, but OBJ is better, but not in this case, but in this case. And you're like, oh! Why can't I just have one!

In fact, I was talking with one of the developers-- and I'm going to be talking to him later on today about why. He's like, well, why does it work over here, but doesn't work-- I'm going to have to go through and figure that out. Maybe it's just a matter of code, by clicking a check box and the next release of InfraWorks will just work with all of those, which would be nice.

Glossiness does not support, does not support. Opacity supports, supports. Bump normal, supports, supports, does not support.

So in my estimation, your best option is FBX number one, OBJ number two, and COLLADA number three as far as the most compatible and the least compatible based on this chart right here.

A lot of it is also going to be based on, do I really need animation? Well, you're going I have to forgo your bump maps and some of your other functionalities, but I really need that spinning windmill like they have in their samples for InfraWorks. Or I have a car that's moving, or whatever. I need it there, it has to be there.

So I want to go a little bit over 3ds Max first. And then we'll come back to this. And this is getting more into InfraWorks. How do you create your actual libraries, walking through this process. There's all these buttons, but how do they work and what can you do? So let's go ahead and stop here for a second. I'm going to jump over to 3ds Max.

And by the way, I provided all these scene files, all the materials, all this stuff with the class materials in the class document itself. There's several locations where it says "link" in the document. If you click on that link, it'll go to my one drive page. So it has the documents as a PDF. A PDF document as well as a zip file with all of the class materials inside there. So there's some FBX files, and OBJ, and Max files.

In fact, we're going to learn-- again who uses 3ds Max here? Do you have the design version

of 3ds Max or standard version? So if you have design up to 2015, it comes with Civil View, which is a great application for taking content from civil 3D, bring it into 3ds Max and generating roads and other content. But it ships with a whole bunch of cars. And they're actually really nice cars.

Well I've got a process that I've come through for this class and I walk to it in the document-- and we'll go through it in class as well-- on how to take those cars and get some scripts, break them down into the right formats that you need-- because they're all arc and design materials-- how to convert them into standard materials. Then export them and get them into InfraWorks and use them as part of your library. It's free content that you already own. There it is. And they're really good cars too.

So what I have here is I came up with a couple of really simple objects. And you probably have seen similar types of things like this before. This is just a simple little 3D object that gives a general idea of how an object will look with different kinds of materials applied to the surface.

And I placed several of them into this scene to give you an idea of the different types of materials, and how they've been applied to the scene, and what does and does not work. So you can bring this into InfraWorks and see what it ends up doing. So an interesting thing-- so for instance like this object here. We have a TGA. And this TGA has an alpha channel.

Now, when you're working with a TGA inside of 3ds Max-- and please forgive me if I don't work this through on SketchUp, but I'm pretty sure they're similar workflows with that, and Rhino, and Maya-- when you assign material to a surface, say in 3ds Max, and you have alpha source. So inside my viewport here, down here on the bottom. I wish this projector was a little bit better. You can see this thing called alpha source.

And if I go ahead and select "None", you'll see that the original material is there. In fact this is what the original material looks like, it's just this checker pattern lines, magenta and cyan. But there's an alpha channel here as well to explain it.

And if I go ahead inside of 3ds Max and they say, hey, the alpha source is off, it doesn't knock anything out. If I tell it the image alpha is on, then it goes ahead knocks everything out. And you can see the original material here without the diffuse color on it is just blue by itself.

So you can say it's almost like a decal kind of process. Cool to have a decal. And here's a good example of a decal process over here. I just wanted this surface here with a window. It's

like the side of an aircraft or something. And this is just a cut out little piece. So if I were to take this object right here-- I'll just make a duplicate. We'll go ahead and put it behind here. Click OK. And in this case, it's knocked out. But if I go ahead and turn this on-- I have my opacity map, you can kind of see behind it. So you see something behind it. And it was designed to be more like a cut out here.

So anyway, that just allows you to be able to see what the original diffuse color is-- [AUDIO OUT] and be one step further. Sounded like my mic cut out there for second. I'll go ahead and turn this back on. Where are you, you bad boy.

So when you're dealing with the material inside of 3ds Max, you have your ambient, your diffuse, and all your different color channels that you can see here. And you can not only have a color assigned to it, but you can also have a map dropped into the channel itself. And you can go ahead output something. And when I built this, I decided to see what each one of these would come out as. So in this example, I'm going to take all these objects minus you.

And there's two things about them [AUDIO OUT] so that the materials do this little rotation thing here as well. And we'll see how that works with COLLADA, and so on, and so forth. So you look at them here with 3ds Max. I'm going to go ahead and export these. Export. There we go. And we'll go ahead and go to models. And let's just call this samples.

And when you're exporting a file from 3ds max's FBX or [AUDIO OUT] There's going to be different options available to you here. [AUDIO OUT] is I usually have at least smoothing groups checked, preserve instances, and one of the other important things is preserve edge orientation. Usually these three checkboxes-- nothing else that's going to be in there, like turbo smooth or any of that stuff is going to really matter to InfraWorks-- but it's good to have at least those three options checked.

In fact preserve instances is key, especially if you have a scene that has lots of repeating objects. So let's say your object, which is a lamp pole-- and it's a particularly ornate one. And each one's about 5,000 polygons, and you need to go ahead and replicate it with some sort of bridge structure that you're [AUDIO OUT] With all that extra geometry [AUDIO OUT] is say 150 megabyte FBX file, because you have all these really ornate lamp holes there. Like instance it's going to say, oh, this is an instance of every lamp. It's going to load one instance and then just a couple of kilobytes for each addition instance to reference back to the original point say, OK, but I'm in this point in space. And so 150 megabyte FBX file, which by the way would be

gigantic, is now down to say 10 megabytes or something like that because it doesn't have to have 50 versions of that lamp-- individual ones in there.

The other option that's really important is this right here, embed media. Now the reason you want to embed a media element with FBX is because if you don't, you have to make sure you go get those maps. So who here put all of your maps into the same channel for your projects? Raise your hand. Exactly. Yeah. You've got them spread out to this library here. Maybe you poached it from this project over here. And they're spread out all over the location. And what happens when you want to send your file to your client, or your colleague, or someone else? You have to go through and collect all that data.

Well, by embedding the maps, it's going to take the original format that you used-- TGA, TIF, PNG, whatever-- it's going to embed those inside the FBX file. When the FBX file is then opened in InfraWorks, it's going to essentially extract it, take the binary data for the geometry itself, and it's going to create a subfolder. So if it's called lamp.fbx, you're going to have a subfolder called lamp.fmb. And it's a folder, and it's got all of your maps inside of it. So it's always best to embed. Yes?

AUDIENCE: We've had SketchUp stuff [INAUDIBLE] then they would send over their work in a zip file and they wouldn't have the bitmap and stuff. I'm like, well, you need to send those to me, because I got to put those in a library in order to see that. But will this embed it automatically?

MARK KAUFFMAN: This will automatically embed it for you. So depending on the application you have, it'll open the FBX. It's actually part of the FBX standard. You guys are familiar with Word. There was the old doc and then there's the docx format. The docx is like a container version that contains an xml file as well as the doc file itself. This is kind of a similar type of thing, it's an xml wrapper for FBX that can contain multiple elements, which is good. It's kind of like zipping it up, but it's more generic to that. And it'll open in any application that can open FBX I think 2009 or higher-- I could be wrong about that. If there's any Autodesk people that know? I don't know if there's any Autodesk people here.

So anyway so we have this different format. The other thing that's also really, really important-- and this is more of a 3ds Max, Maya type of thing, because they're going to be able to support the newer versions-- but if you look at the actual FBX plug-in that's associated with it-- so this says the version 2016.1 release-- you have the ability to select older file formats.

So in this case under Advanced options here, I can go ahead and go to FBX file format. This

says version type binary, just leave it as binary it makes a smaller file. The other thing is you have the ability to select the version of the FBX file. Now, this might be important to use the newest if you want to say, send to Mudbox or send to Maya.

But if you're sending it to InfraWorks, do not select 2016, because it'll look at it and say, I have no idea what you are. And while the InfraWorks team has done a really good job of implementation of FBX, they haven't gotten up to speed as much as the DCC applications are for Autodesk stuff. So make sure it's at least 2014-2015 and older. In fact, 2014-2015 is perfect, that's the sweet spot where it supports a lot of stuff.

Go ahead and click OK. It'll export my file. And then what I'm going to do for this is I'm going to bring it in as an actual object in the scene from my data sources. And I'll go based on the notion that all of you know how to use InfraWorks for the most part? Good, OK.

So in this case, I'm going to go ahead and load the scene up. I'm going to import my 3D model. Navigate to my folder. And it is here. Where's my samples? There we go. Go ahead and click Open. And again, the model library types, 3ds, DAE, DXF, FBX, and OBJ. DXF pretty obvious why you probably wouldn't want to use that. It's not a particularly useful file format, unless you've got an older CAD model that you want to bring in-- you don't care, it doesn't have any materials, it's good-- and you've got an older version of CAD that can't do anything except DXF and DWG. Why can't you important DWGs as a 3D model is beyond me. I mean you can, but it's whatever. And 3ds, don't use 3ds. Just don't use 3ds.

All right. So, I'll select my sample. So go ahead and click Open. And it does its little thing. I have to go here and say, hey, it's in the right place. I need to go to-- come on, you can do it. There we go.

Now, whenever you import-- and you'll know right off the bat whether the file that you worked with was in the right scale-- is this right there. See where it says XY-M? If you worked in a scene file in feet, inches, centimeters, et cetera, et cetera, it's going to say XYIFT, which is international feet or XYFT, which is US Survey feet, and so on, and so forth. You'll know that, for this, if you're just importing it is a data source it's OK. If you're importing it as a library element, bad. So it's important to note.

So in this case, yay, we were in meters, were good. We don't worry about coordinate systems here, we're going to use this interactive placing, because I just want to place it in the scene so we can take a look at. So I'll go ahead and do that. Interactive placing, loading model-- bam,

there we go. Click OK. Type, city furniture, there we go. Close and Refresh.

Now another thing I highly recommend-- and this is dependent on what your specifics are for this object in your scene-- Hold on, fast fingers. So when you first load your 3D model here, and you could take a look at it-- by the way don't use this as the absolute reference for the file. This doesn't always show it the way that it really, truly is coming in. What you see in the viewport inside InfraWorks is the real deal. That's the most important thing to remember here.

But this is also very important here. Right here, it says Material Handling and it says Auto Adjust. Come on, there we go. Now, this is very important. If this is an object that needs to be the hero object, something that needs to be good, high res is all the time, and is not going through and doing auto adjust-- so what this is dealing with is level of detail-- unless you have a model that has a custom level of detail, so LODE0, LOD1, LOD2, and you can specify that using custom melody-- and that way you can say here's the three FBX files, and different ones-- and it'll automatically swap them out for you.

Otherwise, InfraWorks is going to do your level of detail. And oh, boy, does that suck really bad. So nothing against the team, it's just they're doing something quick and dirty. And think about it.

Three years ago, something like that, we built an InfraWorks model for the main stage. And they wanted us to build the entire state of California. Now think about it, aside from Google Earth, which doesn't count because it's a very unique kind of application, when's the last time you built an entire state of content? And not just high level, don't get any higher than say 75 miles above it. We're talking all the way from the top of the state, down to LA basin, down in the downtown, and being able to see things.

The fact that you have an application that is not only geospatial, but has the ability to load that much data and be able to display it, not totally in real time, but pretty darn close is pretty amazing. It truly is. And so it has to do a couple things to deal with level of detail, and that's fine. If you have a hero object though, don't let InfraWorks works deal with it.

So what I'll do here is instead of going to Auto Adjust, I'll go ahead and select Direct Display. So basically Direct Display says, use whatever the model came in, always show it that way, never go ahead and make it disappear. If it's city furniture or some other element that you're going to use in your scene and you don't really care about it doing LOD, go ahead and leave it

on auto adjust. A lot of times Auto Adjust is not necessarily meant to degrade the geometry, although if you look at it sometimes, you'll see it suddenly turn into this massive polygonal garbage. It looks like someone took the models, chewed up in their mouth, and spit it out. And you don't really care, because one of the things that it also does is it turns the object off in viewport, which can significantly increase your performance.

Now, we all love to show InfraWorks with high quality visual effects, with all the ambient inclusion, and the shadows, and everything else, that's great. But, man, it kills the performance. So that's a great place to show the client these kind of quick little snippets or you're doing renders, that's when the high quality is good. Otherwise, I just turn that thing off so I can navigate around my model and do what I need to do.

AUDIENCE: [INAUDIBLE]

MARK KAUFFMAN: So the question is, can you adjust it? So the Auto does it for you. There are some other options-- and I don't want to spend too much time on this-- but you have the ability to select Auto Adjust, which is that. Direct Display, use LOD, and you can specify a distance. So you say this is a little bit more of Auto Adjust plus a couple of extra parameters for you to say, anything beyond 200 meters, turn it off or do whatever, otherwise, keep it on. So it allows you to have your cake and eat it in this particular case. I want some auto adjustment, but don't do it too much.

AUDIENCE: What I meant was, after you made this decision and clicked OK, [INAUDIBLE] and then three days later, I decide I really wanted it to be what it was when it was brought into me--

MARK KAUFFMAN: OK, so the question was-- and I'm saying this for you guys and for the recording-- the notion is, if you make this adjustment now and you want to go back and change it later? The answer to the question is, yes. You can go back and change this at any point in time. So if I select this Direct Display here. Close and refresh. Close InfraWorks. Open it up three days later. I go back there. Go to samples Go to my 3D model. Go to Model Handling and switch it back to Auto Adjust. It's a dynamic thing, you can change at any point in time.

OK. So we'll take the Auto Adjust as red. So as we go ahead and zoom in here-- and I've got my high quality turned off in the viewport, so we've got a little bit better performance-- but as you can see here a couple of interesting things compared to what we saw in Max. So for instance, for this PNG here, and I'll give a quick example. My PNG is using nothing special. It's got image alpha, so it's able to see through the white areas. It's using the transparency there,

it's cutting through it and it's able to see the blue. But look what happens inside InfraWorks, it makes it completely transparent as if it's an opacity map that's been applied to the object. So that's an important lesson to learn here, because what we really should have done was if we wanted to see through that, there's really no option that you could use in this particular option. You would have to, in essence, build a map that has blue in it as opposed to the white.

So in this case, lesson learned is it doesn't translate over. That chart that I showed you earlier about what is supported for those map types, shows you what the map can do, but it doesn't necessarily show you what InfraWorks will do. So my recommendation is, if you want to do more of a decal, you're going to have to create a custom map, which is kind of a drag. Now that is InfraWorks as of today. The guys are doing more development and guarantee that more of this is going to start working.

And it's kind of the same thing for the other types. But interestingly, here, there is no alpha channel, so the white came through. Here, the transparency went through. And on this one-- I actually intentionally did this so we could take a look-- so I did an opacity map on this. And the interesting thing about the opacity map and the fact that-- I have an opacity map and I also have this transparency option for the alpha channel inside 3ds Max. So again, inside 3ds Max, you could select the alpha source. I can turn it off, so it just uses the white here. Well, when you have both the alpha channel and an opacity channel, you get this kind of weird hybridized semi-transparent wonkiness. Can you see the transparency through the magenta areas here? That's not what I wanted. I wanted it to be cut out showing the opacity map on top.

So in this case, what I'd have to do is go back here. If I want that opacity, I've got to completely turn it off. So I'm going to go ahead and export this. We'll just save over the original file, which is Samples. Save? Yes. OK. And install doesn't work very well. So in my case, don't add any transparency with a TGA. If you want to do anything, do it with a PNG.

But you'll notice that a lot of the other things came through. So for instance, our bump map came through, our normal maps came through. In this case, I did an example of specularity, and not just specularity, but colored specularity. So this object here has a color specular channel here. As you can see right here. Whereas this one has just regular specularity.

And you have the ability to also adjust the intensity of the specularity. Now, this is an important thing. I'm going to go ahead and select this.

I've got a lot of intense specularity, here. And I've got color specularity, here. And I'm going to

re-export everything, here, and instead of doing an FBX, I'm going to do an OBJ. And we'll take a look at the comparison between the two and what you end up losing. I'm not going to do COLLADA, because it loses pretty much everything, except animation.

So I'll go ahead and do an export again. I'm going to select OBJ. We'll do Samples. And for this, pretty much whatever your defaults are, but you always want to make sure that it exports the materials. This has the ability to go through and create a model library, it'll convert it all into a specific file format and put it in a subfolder along with it. It's not as compartmentalized as the FBX, which is one file and then it extracts itself. This is an OBJ with a sub file, a map file, and a bunch of other subfolders inside of it. But pretty much the defaults will work for this.

I'm going to go ahead and select Export. Also OBJ takes a little bit longer to export, no big deal. We'll go ahead and go back into InfraWorks here. I'm going to open. And we'll select objects samples, OBJ. Go ahead and the same window-- Samples. We'll go ahead and set it to City Furniture. We'll do interactive placement, and we'll put them right here. Click Close and Refresh. And voila!

So you notice here, see how that intense high specularity that we had inside of 3ds Max? And why would you want to do a high level of glossiness to your specularity? To make it look more like brushed metal, as opposed to glass, or plastic. So it's a way to define your material as a specific kind of material. Well, the problem with OBJ- and while it supports pretty much everything else that happened here-- it's got the-- actually this is interesting. That's all jacked up. That's the bump map, whereas over here, better. And one of the things I forgot to do-- this is my hero object, got to make sure that auto adjust as off, just direct display. There we go. That way if I get a little bit further, it doesn't start to change.

You can see that we ran into some problems here. In fact, the shading is kind of wonky for us. For the normal maps here, they're not quite right. But look at the specularity here. In fact, the specularity-- it just completely ignored the glossiness.

This is something that I was discussing with the developer the other day. He says, well, wait a minute, why is it that you have a 30 specular over here and you have a 14.3 specular, or whatever it was, over here? I said, well, it's the same object. I just exported one as an OBJ and one is an FBX and it's just a bug. So the nice thing about bugs is they're meant to be fixed, and they'll be fixed.

But in this particular example, you see that not only is it messing with the specular attributes, there's no adjustments other than specular on, specular off. You are able to look and see that it does have the color specularity. But the other problem we're running into is it's not adapting the map properly. It's got a weird mapping coordinates problem here. We're getting this wonky normal map here, whereas this bitmap seems to work fine here.

So again, using that chart that I showed you before, your best option is FBX for the majority of your content provided that your application-- the example was SketchUp-- likes to support it. OBJ is a good close second. You've got a couple of problems that you might run into, but for the most part, it'll support everything.

The other thing I notice-- and we're going to take a look at a case here, where we have a whole bunch of characters. So we got a character library. There's this great company out of Germany called, Rocketbox. And they create these really high res character models that are pre-rigged and everything. They have nice, high quality 8k TGA files that they use for the maps for all the channels, they're fantastic.

What we did is we went through and posed a whole bunch of them and then frozen them into a specific position. So they don't have to have a skeleton or anything in there. And we built an entire library. While I cannot provide that to you, because it is licensed content. That's bad, to provide free things to everybody. The reason I'm providing the two cars in here is because if you're a 3ds Max user, you already have access to the cars. But anyway, what happens here is that I'm like, great! I'm just going to send them directly into InfraWorks. Oh, no, no, no, no that did not work, because-- and this is another little, I don't know if this is a bug or if this is a way it's working, but it's not working quite right.

It's one of my favorite things. It's a feature of the program to do that wrong. Well, it's not a feature, it's just the program is doing what it's supposed to do right. It's just the original file that you get, there's something wrong with it. It's corrupted, there's header data that's doing something, and it's not working the way it is. And we'll get a chance to look at that here shortly.

But in this case, it's good to see that, hey, FBX works the best, provided it works well. OBJ is a close second. Now COLLADA is our third. I'm going to go ahead and export COLLADA. And it's going to miss a lot of this data, but you're going to see what's going to happen. So I'll go ahead and export. COLLADA has a very similar window to what you see with FBX. We'll just do Samples. And I'll go ahead and export a similar document window. What's important

though is that animation here is checked.

So I'll go ahead and export this. And this will take a nice long time. While we're sitting here waiting, we'll play some nice elevator music. No we won't.

AUDIENCE: Can you [INAUDIBLE] your SketchUp to 3ds Max?

MARK KAUFFMAN: The majority of our SketchUp goes to 3ds Max, because that's where our primary workflow is. So I told you, we had a user who's using SketchUp, because he could rapidly build buildings. Then we'll bring them into 3ds Max, drop him into our models. Because a lot of times we use [AUDIO OUT] in several different ways. We use them for real time applications, because we use the unreal game engine-- the unreal 4 game engine for doing interactive stuff-- we'll do visualization animations and whatever to our render farm using Vray. And we'll also do a lot of construction sequence models, going to Navisworks. And we'll also build models--

And a lot of times when you're doing construction or other things, especially large infrastructure projects, I've got a building there that's useful as reference and context to what I'm dealing with. And we'll build that building very light weight. It's quick to do in SketchUp. We'll bring it into Max and then we'll start exporting NWC files of different construction phases, especially if it's a building that has to be demolished or something else, we'll export them. So I guess the long answer is, yes, we use SketchUp, but we bring it into Max primarily as our method.

AUDIENCE: Can you take what you made from Sketchup to Max and go back and [INAUDIBLE] as an FBX?

MARK KAUFFMAN: Yes. So that's I guess your other option in this case. Yeah. I'd be interested. Have you would use 2015 or 2016 SketchUp yet?

AUDIENCE: Well, I did a model with 2014 I think it was. And I upgraded it obviously, but I haven't checked the ending occlusion. It's a problem with the ending occlusion in the back basement. And the development team knows about it, but they just don't have the answer of why the files are making under ending occlusion all the dark spaces blackout. Sometimes it will work, sometimes it won't. But it depends on what's going on with [INAUDIBLE] the triangle. [INAUDIBLE] all the faces and all the lines that you're viewing. So they said you just have to print the occlusion off. And I'm like, well, cool.

MARK All right. Well, every software has its idiosyncrasies and I don't try to disrespect anything too

KAUFFMAN: much, because honestly I love Max, but it's got its problems. I love InfraWorks, it's got its problems. And so on and so forth. It's not fair. You just have your workflow issues, you workaround them, and then you tell the developers and say, fix it please! Yeah. It's a little bit more convoluted, but it's a good methodology.

One of the things I really like about 3ds Max, personally, is it's a good aggregator of data. So we get so much content that's CAD and everything else that we need to aggregate in 3ds Max to get it somewhere else, to Civil, to Navisworks, to MicroStation, and other things like that. OK.

So I want to show you that example of the people file. I'm going to go ahead-- and again, I don't provide the class, but this is a good example. Now, here's the first thing that's going to come up. If I want to make assets that come into InfraWorks, I want to make sure that they're in the right scale. This original file is in inches, it needs to be converted to meters. So instead of saying, yes, adapt the file scale, no, I want to go ahead and adapt the system unit scale. There we go. And we'll go ahead and zoom in here.

There's a good example of these different characters. They're all in T-poses, looking like this. And you can do whatever, so I had a bunch of people just go through and do some high-res versions. And they're not perfect, they're not great up close. I mean they look OK, but much better than the not very good people that are inside InfraWorks. I think we can all agree that they're not good at all.

So what we did is just a bunch of different poses, people walking and talking, and doing things that they want them to do. And even the same gal sitting down, standing, et cetera, et cetera. This one, which is great, she's walking up the stairs. OK.

So I want to show you an example of what I ran into. I'm like, great! I can just export this! And in this particular one, I'm going to go ahead and sample this guy. He's broken up in an MSO. Quick note. InfraWorks will support multi/sub object materials inside 3ds Max. 3ds Max is kind of unique in this way. Most of the other digital content creation tools we'll go through and go ahead and build these objects, but don't export a different object with an individual material. Max you can have one object with multiple materials assigned to it.

In the process of export though, FBX says, oh, I and understand how to delineate this and technically breaks it into pieces. Even though the pieces are not detached, when you bring it

into InfraWorks, it's one big giant model, it understands how to deal with that. So you can do multi/sub object materials with 3ds Max. However you'll see with this example a little bit later that I've run into with the cars, that's a problem. That's why I come up with some scripts.

So in this case, I have my guy. I've got a body, a head, and opacity. And the opacity is for his hair. And then body here, we have TGA channels for specular level, diffuse color, and bump. And the bomb, in this case, is an actual normal map.

Now, what's interesting here is, you look at that chart, specular maps are not supported with FBX, but they are supported with OBJs. But the problem with OBJs is you've got a fixed glossy amount, so everything's really, really, really, really glossy and not diffuse or anything. So at this point, it's almost like, don't bother with a specular map at this point. Well, no big deal.

So let's go ahead and export it and see what happens. You can imagine, I was so excited. I could do all these individual people and have them in there! We'll go ahead and export it. Export selected. We'll call this one, man. I think I actually grabbed one right there, but we'll just write over it. Click Save. Yes. Place. Voila!

And we'll go ahead and bring it in. I'm going to bring it into the library. We're going to jump over to the library thing here shortly.

So go to 3D model. And I'm going to create a whole new library and I'm going to call this, high-res people. I'll go ahead and add a new person. Go ahead and model URL. We'll select Man. Click Open. And we'll wait and we'll wait.

And here's a good example of what's happening. It's going into that folder. Here's the man file right here. And here's the man01.fmb. So inside there are all the TGA files that were originally assigned. So it's taking and compiling them together for you.

So we take a look at this. That looks really bizarre. I'm thinking-- what? So I went through and I was really confused on this. And I'm thinking, is there something wrong with the mapping coordinates? Is there something else going on? No, it's the TGA file. There's something wrong with the TGA file. And to be more specific, the only way I could fix this was not saving over the TGA, I actually had to save a completely different file format. Then I could back save to a TGA after it was something else. It was like the ghost in the machine with that TGA file, I had to get rid of it.

So let's take a look at that same exact thing, using a PNG. So I'll go back to Max here real

quick. I've already gone through and saved out a whole bunch of different PNGs. This is Man. Female. Let's do details, OK.

So we need to do M004 body. And we'll do PNG as opposed to TGA. [INAUDIBLE] same thing. I don't need specular. And just for the purposes of doing this demonstration, I'm just going to go ahead and let's say there's a normal in there. But I did have to replace the PNG normal as well as the TGAs for everything had to be completely replace.

So I'll go ahead and export selected. Now, here's one thing I've run into in the past-- and that is for some reason we've gone to the Bahamas here. Of course it has. It's thinking about it. It's doing a lot of thinking about it. OK, well, we won't wait for too long.

But anyway, while this is going to the Bahamas and having a Mai Tai, what's going to happen here is, when I export it and bring that FBX into InfraWorks, it's going to be stellar. So it's a good example of where I've run into problems where maps will actually cause these weird coordinate aberrations. And it will look fine and say FBX Preview, which is an Autodesk application, but in InfraWorks, it just loses its cool. I don't know why. So sometimes-- and I've actually seen this happen with other applications, but always check your bitmaps. So in this case, PNG is going to work a little bit better.

Wow. It's gone totally to the Bahamas. Let's go ahead and not wait too long here. We'll go back to InfraWorks. So let's take-- wow, OK. I apologize. Well at least Office is working. PowerPoint. Good ole PowerPoint.

There we go. I think it's coming back online or something. Check antivirus status, wow. I got to tell you antivirus software is a virus in and of itself. If you've used Symantec or McAfee, it's insidious.

One thing I really like, and I'm not trying to push anything, but that Defender whatever security essentials that ships with Microsoft default for free, works. It's the least intrusive antivirus software application I've ever used and the least expensive. Avast is pretty good. OK. So there we go.

Export selected. Go ahead and do my man. And one of the things I'm going to do is I'm going to delete that FBM file folder, because sometimes what will happen is it'll still go back and reference it.

So select my man. Click Save. Replace it. Click OK. Go back to InfraWorks. And we'll go ahead and load it in here real quick. Where's man? There we go. There he is mostly. Oh! Because I didn't do the head and the body, because remember it's an MSO. But you see the body. Whoo! He's a stylist guy. Looks like a mannequin though, with that funky head, but you get the general idea.

So let's take a look at the whole process. We've looked a little bit at the materials themselves, what the idiosyncrasies are. You've got your chart to kind of see what you can and cannot do with getting content in. So let's look at the actual process of getting content into InfraWorks and specifically how to deal with your library.

So I'm going to go through this other thing real quick. I've got the whole slide show for the purposes of whatever. But for the model catalogs-- and I'll just zip through this really quick-- so we have our first option, what those different buttons do.

So the first one is-- create a new style catalog. Delete an existing. Import style catalog. Export-- this is an important thing.

If you're creating libraries and you want to save them and share them with your colleagues in a centralized location, file server what have you, you export or import. Now, what's important to note is this is not any standard file format, like FBX or an OBJ or a DWG, it's actually a JSON file J-S-O-N. Essentially what it is, is it's a compiled, kind of like that FBX, it's a compiled zipped sort of file that's inside there. And inside there it has this SFF, which is the native file format for InfraWorks. It also contains the materials. And all the other definitions, XML data to explain it and everything else. It's all contained in that JSON file.

Duplicate style catalog. So here's a good example. I have my DOT catalog with all these barriers or whatever and let's say, Iowa dot uses the same standards as Illinois dot. So I just duplicate it and make a couple of changes. I just duplicate the catalog.

Rename the style catalog. Imagine that having to happen.

Create new style in current catalog. So once you've created the catalog, I want to create a new style. A new style is just, this is my new object, my new material, my new whatever.

Delete the style the current catalog. I don't like it, let's make it go away.

I want to copy the current highlighted-- now this is an important thing. You've created a

catalog, you've got it in this folder, how can you move it from this folder to this folder? Wouldn't it be nice if it was like File Explorer, you can just drag it? Well, you can't. So you have to copy it from this folder to the other folder. When you do that, it'll say, hey. It's going to provide you a list of all your other catalogs and then you can copy it. And it's not just moving it, it's copying it over there. You still have to delete it if you wanted to move it, but you get the idea.

And of course, create a duplicate style. This is really useful once you do that-- so here's a good example. I created a road style, now I need to do a bridge version of it and a tunnel version of it. Well you've got all the lane configurations and all the other things on there. Well, why reinvent the wheel? I just want to duplicate it and then add whatever I want to change.

Finally we have rename style and edit the style. Edit, you can either click on that little pencil icon with your style selected or double click on the object itself in the catalog and it'll be there.

So let's go ahead and-- Well, we've taken a look at that, let's actually do it! There we go. OK

So in this example, I have my high-res people and, in fact, what I want to do is I want to create a new style catalog here. And to go up, you just have to double click on your parent. And I'm going to create a whole new style catalog. I'm going to call this MTA rail components.

By the way, included with this class files, is the JSON files of what I'm doing here. One of the most important things is-- we go through this in the class, you're like great, but I had no idea what was going on. I was just reading my email or possibly I didn't communicate something effectively, you can always reverse engineer it. So load it up, take a look at, and reverse engineer it.

And by the way, if anybody here's interested, I'll provide you my business card and you're more than welcome to email me directly with questions, if you have anything, afterwards. OK. So we created this. We have 3D models, MTA rail components.

I'm going to go ahead and go to my style catalog. Load URL. And I'm going to load a couple of different things. So I'm going to go ahead and do some bridge sections, actually going to load in some [? peer ?] components, some tracks, and some other things.

So I'm going to first start off with my OCS, overhead catenary system. Like so. Go ahead and click OK. And we'll call this one-- and this is where you call it a specific name-- [? Dool OCS ?], which makes sense to me. Go ahead and add another one. Go to my next catalog. We'll do [? peer ?] type A. This is more of a bridge component, but I'm going to use it for my rail

components. And it's really simple.

Now, the cool thing is you can build these components. You can build really complex road structures. In fact, we're going to get a chance to look at-- in this case, use the road tool to be able to build a rail configuration. But you could also use it for road and other things like that. The nice thing about this is, the road tool, you can go ahead and draw it out, you can elevate it and bring it down below grade, and do all these wonderful things. And if it's a design road, you have also the ability to specify your profile and some other things you can do with the design roads, which is a nice.

So I'm going to bring in a couple of components. I'm not going to go too much further into this just in the interest of time, because we have about 15 minutes left.

But I'm going to go ahead and go back up to the parent here. I'm going to load in just that catalog. And I'm going to import. So that's this icon right here. And again I've got two LRT rail components and MTA rail component styles.json. By the way it has that icon here, because I just loaded some Visual Studio code, which is a free little code editor application from Microsoft. And now everything with a JSON, or JAVA, or whatever it's in there.

So I load that and now I've got an MTA railway. I've got my pier A, my single track, my single OCS. We'll go ahead and load another one. No, I don't want to do that. I want to import. And we'll do the LRT. Come on. You can do it. This is a much bigger file.

So it was that road. There we go. The other one is an actual road component and we'll take a look at it here. We've got an LRT guide way, which is this. So again, something that you can look at we'll take a look at how to build. And one's an actual LRT guide way with a retained fill approach. And we'll get a chance to see this ends up building inside there.

So again, this whole system is built is all your 3D models go into your 3D models tab, which is right up here. And anything you put inside there, they have to be individual components. And these can be used for anything. They can be used for decorations, [? what's ?] say use here. If they're people, they could be just people that you drop onto the surface.

If they're trees-- by the way, we just bought a copy of a software application called, Tree Storm. And Tree Storm is really good for doing high quality trees for programs like 3ds Max. We got the cinema version, which costs an obscene amount of money, but it came with all the seeds of all the different tree species. But it also saves out low-res trees, which you can bring

in here and use. There are some limitations, but you can make those changes in your DCC application and then bring them into InfraWorks and you've got a ton of different species of trees.

And one of the things I ended up doing here is-- I'm going to create one more folder, going to call this High-Res Cars. Cars, there we go. And in High-Res Cars, I'm going to go ahead and add a couple in. And again, provided with this I have-- let's see where are they? Where's my? I didn't save them out. Maybe that was part of the class--

So we'll just go here real quick. I'm going to go ahead and save out the Prius. And we'll take a look at it real quick. And the Cars folder is provided with this. I have a Toyota Prius. And these are the cars that come with Civil View.

So I have both a Honda Accord Coupe and a Prius, we'll go ahead and open those. So this is a little Prius. it's got a decent amount, it's not a lot of polygons, but it's still much better than some of the cars that are in there. It's got a certain level of transparency here and everything else. I used a great little script to originally bring the car into 3ds Max, convert everything to standard materials from arc and design, and then break up all the MSO materials. Because it can't do fragmented MSOs-- you have MSO 9, MSO 13, and 25-- it has to be 1, 2, 3, 4, 5. It has to be in a specific direct order. This broke it up into individual pieces and if we have time we'll go through that real quick.

But in this case, I'm just going to go ahead and export. Go ahead and save this as Prius. Save. Again, always embed your media. Smoothing groups. Preserve instances. Preserve edge orientation. Make sure it's 2014-2015. There we go. We'll go to InfraWorks. We'll go to Models. And where's Mr. Prius? There he is.

Because this is a object that I want to use specifically with City Furniture and I want it to do automatic LOD, I'm going to leave it on auto-adjust. Just like what you saw with the data import for the object itself, any of the 3D models also have an auto-adjust option here. I'm going to go ahead and click OK. There's my 3D model, I'll just call this Prius. And the nice thing about this is if I go to my city furniture tool, I'll now have the Prius inside here. Let's see 3D high-res-- there it is, right there. I'll just double click. Voila.

Now, let's take a look at this real quick and see what's going on, which is interesting. Nice little car and I mean it's a decent looking car, it's not perfect. Go ahead and turn on visual effects, it'll look a lot better.

That's got the transparency from the windows, everything that was part of the original piece. It's got all the maps and everything attached to it and it looks a lot better than what you had there before. Some of these other cars that they have are kind of scary, but you could go through and convert the entire Civil View library in about a day. I'll let you guys do it, it's a good exercise.

Oh! I wanted to show the DAE thing. So let me go ahead and import real quick. Let's go here, data sources, 3D model. Where is samples? DAE.

Takes a little bit longer to bring these in. What's important about this is there's a visual effects option here that must be turned on in order for this to work. Again, city furniture interactive placing and see, they're moving. There it is. Close and Refresh. And currently they're not moving, they're at the last position they were at when they were gone. But if you go into your visual effects option inside InfraWorks, which is right here under the little tools icon here, turn on animation, and voila! There they are.

This is really nice when you have something that's constantly moving. The examples that they have on the website is a big turbine wind farm. But if you have something like a car that's constantly moving-- here's a good example by the way of no bump maps preferred DAE. Always the same specular value, just like the OBJ, there is no glossiness options. It does support the transparency though, so that's good. So you just have to realize that at least most of what you probably need is at least transparency, definitely diffuse, bump is nice, but not absolutely mandatory. So COLLADA can still be useful. I'm going to turn that off. Do that real quick. OK

So in the case here, we'll go ahead and go back to this. We've got all our different 3D models built into there, so I've got my--

AUDIENCE: With the animation, as far as the time scale between 3D Studio Max and here, how does that look? If you're looking at Max and you're looking at frames per second for your timeline, how does that equate to InfraWorks?

MARK KAUFFMAN: That's a great question. So the question is, how does to the time scale for animation translate from 3ds Max to InfraWorks? When you export a DAE file or a COLLADA file-- and I'll just select Samples here, yes. For animation, there's some extra options here. Actually for this, there's really nothing else. It's going to use whatever the frame rate is for your particular scene

file. In this case, it's using 30 frames per second. If you set up your original scene with 25 frames or 24 frames, it's going to use that is its dependency for export.

AUDIENCE: [INAUDIBLE]

MARK KAUFFMAN: Yes in this case. And that's provided that your animation is set up to loop. If it's not set up to loop-- mine just happens to go a full 360 and it just goes. If it went 180 degrees, it would snap back to 180 and snap back to 180. So anything that you would see inside of 3ds Max in your timeline is going to be the amount. And if it's 1800 frames, it's going to export 1800 frames of animation.

It's important to note though, inside 3ds Max, it'll support simple transform, so position, rotation, and scale. So if you have an object move from point A to point B, it'll take that. If it moves up and down, if it rotates, if it scales, all that information will be retrained. If there's any additional animation attributes, like animated materials, doesn't support it. Animation to a modifier in 3ds Max, so if you have a bend modifier, that's completely ignored.

Any other kind of deformation modification to the geometry-- so a vertex is moving from here to here, it's just the entire object moves. None of the vertex is deformed. So in that case, the bend modifiers, something similar, if you want something to wiggle at the end.

Or more specifically, I want a person walking. If someone said, hey, we've got populate now, can we populate characters in? I said, yeah, but without the animation. Wouldn't that be great? Have people walking down an avenue, even if they're looping and going through? That would be an awesome piece to have for InfraWorks. So [WHISPERS] development team. Here my pleas.

So in here, we've got our different pieces, Our high-res people, our high-res cars, and of course we have our MTA railway pieces. And then I have these roadway components that I've built. And again, I'll just kind of go through this really quick, because we've got five minutes. Wow. Too much yammering. OK.

I don't know if there's another class in here, but if you guys want to stay a little longer. If you have to leave at 11:30, please do so. Otherwise, stay and we'll stay here as long as we can and we'll keep going through more stuff.

So what's going to happen here with the roadway-- I created a custom roadway, the same

basic thing. I want to create a brand new roadway using this. Now I call it LRT rail components. And I ended up creating one.

So I'm just going to create one from scratch here. It's a road. I don't really care about the material group, but I'm just going to go ahead and set it like Boulevard. Here's an example. Some of these basic settings. But these two options right here, decorations and custom profiles, are the pieces that make this really cool.

I want this to be a bridge. I'm going to go ahead and bring this out. Now, the nice thing that they added a couple versions ago was this option right here, to hide the piers. By hiding the piers, you have this bridge structure-- which is good if you don't need any kind of pier structure there, you just know it's going to be a span that's going to be short enough to be able to be just whatever it is. But in this case, instead of using this road structure, I'm going to set my wall thickness to zero, which is flat.

And for the lanes itself-- I'm just going to keep them this way-- but I'm going to add a custom profile. And that's something that's been added in the last couple of builds of InfraWorks, custom profiles. Now what a custom profile is, is an SDF. So who knows what an SDF file is? One person! That's what I figured. SDF is Autodesk's version of a shape file. Shape file contains additional metadata for geospatial coordinate systems. The only application that will generate an SDF file is Civil 3D and Map 3D. And I don't think you can do it with AutoCAD. Anybody know that for sure? I don't think so. Doesn't support it. So you have to have one of those, but what I did--

AUDIENCE: [INAUDIBLE]

MARK KAUFFMAN: Exactly. So what I ended up doing here is I went into 3ds Max, because I'm much better with that for doings splines. Created a cross section of a road structure. Exported it as a DWG. Brought it into Civil 3D. Re-exported it as an SDF. And then bringing this into InfraWorks. So you have to use an SDF.

I have begged them to please supported at least DWGs, because they're just so much easier. The problem with this SDF is its fine, it supports all the stuff that it supports, however the problem is it takes forever to generate the damn file. Please excuse my French.

So here I'm going to go ahead and select my cross section 1. Open. And as you can see here, there's a little tiny thumbnail of my cross section here. You now have the ability to see your

cross section inside the viewport. So it's like a box girder system here as you can see.

And right now it has the material is white. Well, here's the great thing. I can go ahead and go to my parent level, we'll go ahead and go to roadway, and I'm going to select something other than that. I'm going to select this concrete surface. Voila! Nice concrete. In fact, it's kind of like diamond cut concrete that's onside there. And it automatically will deform to that. So I've got that piece right there.

I can add additional pieces if I want. So let's see, I think this one is-- Come on. You can do it, one more piece. There we go.

So I want this barrier that I want to have go down either side. And so in this case, because it's going down the center, if I offset it it's going to split it out. Let's go ahead and do a track offset of say 15 meters, that's probably a little bit too far, let's do five meters. A little bit further, let's do seven meters. I forgot what the scale was, eight meters. OK. I also want to scale this 2.3, because I didn't do this in meters, I did it in feet, because I'm a bad man. There we go. And we'll do say nine meters, that's better.

So there's my barriers on either side. The difference between this and an object is it's actually extruded and lofted along that line. I'm going to go ahead and close this. I'll add some decorations. In this case, I'm going to go ahead and select from my MTA rail components. I'm actually going to do my pier A. And Pier A is just a simple, kind of duplicating a little thing like so.

I need to rotate this 90 degrees. Actually no, it was right, zero. And I need to adjust the spacing. I need to adjust it to be 100 meters as the spacing for it. So every 100 meters, I've got a pier. I don't want to dual pier like this, because it's actually taking and replicating it down that center point and just duplicating it.

So in this case, I need to manually do a track offset. And I'm just going to do a 2. And I also need to bring it up, so the height offset-- so it brings it to the base of the structure like so. Click Close. And I actually forgot one of my other decorations, which was single OCS. And we'll go ahead and rotate this 90 degrees. These need to be every 100 meters as well. Every 100 meters. Thank you very much.

These need to be tilting. And they need a little bit more of a track offset, so we're going to go out to about 3 meters. There we go.

And I have one last component and that is the single track. Need to rotate these 90 degrees. And they need to height offset just a little bit, so they're above the surface. They repeat every 3 meters, there we go. Actually is it every four meters? Well, we'll do that.

And we also need to do a track offset, same thing with this. Track offset is 3 meters. And again, based on what I originally needed, probably 4 meters. 4.5 thank you very much. Put on tilting, click Close. There's my rail guide way. Really simple.

It just happens to be that it's rail-based, but it could be car-based. The discussion that David Lawrence and I got into yesterday was-- and one thing that I've started doing lately-- is building an actual physical object that is a lane line. So it's just a thin piece of geometry that has color and it repeats every say 10 or 20 meters, or feet, or whatever that you need it to do. And that's how you put in custom lane lines without having to rely on InfraWorks to generate your lane lines, and repeat them.

AUDIENCE: [INAUDIBLE]

MARK KAUFFMAN: Precisely. So in this case, I'll go ahead and click OK. And I'll just leave my road.

Now, I've got these two LRT guide ways built up here. And again, this is an example of where I duplicated and then just inserted the appropriate piece of geometry. And to give an example of what it looks like I'm going to go ahead and draw one out. So let's go to our road creation tool, Roads. I'm going to go ahead and go to my list. And I've got my LRT guide way. We'll start over here.

Thanks for stopping. Come on InfraWorks, you can work a little bit faster.

AUDIENCE: [INAUDIBLE]

MARK KAUFFMAN: Yes. So the question is, if you have a custom alignment, whether it's a 2D shape or 3D shape-- so if you have a 3D center line and you import it as a shape file or whatever, it'll come in and you can say, assign this shape to that and it'll loft that out. Now, the nice thing about lofting this-- Wow. Rather lethargic today aren't we, InfraWorks?

The nice thing about lofting it-- before I used to do these 3D chunks that were 10 feet sections of roadway. And they were great, but when you got a steeper curve, you start to get the seams of the objects pop out like this. The nice thing about this cross section is that it's

physically lofting the object. It's like a loft or an extrude, whatever, along the shape itself. And as a result, you can get it to repeat the material across that surface. If you wanted concrete, and so on, and so forth.

If you really want to do it, you could break it into chunks. So say the road surface is one-- and the nice thing about this is you can add slope, where you we weren't able to do it before. You could do your decorations for your lane lines. You can do shapes to do the barriers and other elements, like curve edges and whatnot.

And again, it's something that InfraWorks is already building and lofting along this path. So you can build these really complex assemblies-- and wow, what is wrong with you?

AUDIENCE: If you had an additional lane, you could build one component as two lanes and one as three and then spread them out?

MARK KAUFFMAN: Yeah. So the question is, if you have multiple lanes changes and InfraWorks would do the geometric morphing from one lanes to two, the transitions from lane to lane. The answer to the question is, no. You can do it, but it doesn't do a nice merge of the two. That is the difference. It'll just suddenly jump out. This is a good tool when you have something that you want to show to a client as a reference. I want to look at all the different pier types, I want to look at the different box girders, the different options, we want three lanes or two lanes. If you want to get any really intricate kind of stuff, then you have to get into an engineering application and do some of that kind of work.

In my experience, the nice thing about this is you're not doing any hard core design, you're doing a lot of preliminary design work. The nice thing about this, though, is whatever you sign here, you can export that line, bring it back to your CAD application, and then do all that hard core engineering work. And bring it back in again. And that's kind of the beauty of the whole process here. Oh! Finally done! Yay! Happy InfraWorks! So let's go ahead and go down here a little bit further.

AUDIENCE: Well, what was that processing thing? You went from CAD to [INAUDIBLE] And then you imported it in here as a cross section, is that what happened?

MARK KAUFFMAN: Exactly so look at this here, here's this cross section. And this was meant to be a retained fill piece. I'm going to take both sections, I've got this here and I'm going to start bringing this up to grade. Oh, I shouldn't have done that. [CHUCKLES] Actually, that's not a bad idea.

There we go. So let's turn off buildings, and barriers, and pipeline connectors, and trees, and points of interest. No, it's just cranky. Well, you kind of get the idea, you bring this up to grade-- man, it is really slow here today. I don't know why. I apologize.

I was doing this at 2:00 in the morning it was like, it's going so nice! And now it doesn't today.

So what's going to happen here is it's going-- this is insanely long-- it's going to go ahead and build that structure. And then what I'm going to do is-- this is my retain fill. So usually you're going to have an at grade to retain fill to bridge structure going out across your bridge structure, then back to retain fill, and then back to grade. Something simple like that. You break it into pieces.

If you do it is a design road, you have the ability to say this is my spline that I want to use from Civil 3D. Maybe they said, here's my 3D splines, make it work. You could go then back and say, OK, this is where the style starts, here. This is where it splits. Then it's going to split into this style and split into this style.

AUDIENCE: As long as the extrusion is aligned with your geometry from your road design in Civil 3D, all those things will work with each other?

MARK KAUFFMAN: Yes. The nice thing is this will also come into Civil 3D as physical geometry. You can get the line and you can get the geometry. So if you need it as a reference at any point.

One of the things I've been finding is-- so we'll have someone go out do a scan, a laser scan of a location, and Civil 3D will generate surfaces off that, but it's not a particularly efficient surface. It is not meant to be, it's not meant to do optimization and whatnot. So what we'll do is we'll bring that point cloud into 3ds Max. We'll model out the context of the location that the engineers want to work with, the buildings, any other specific components. We'll make a light-weight, you know idealized for real time model. We'll load it into InfraWorks. And a lot of times, we'll bring it directly into Civil 3D. The Civil 3D engineer can then look at it and they don't have this $5 million polygon thing that was generated off a point cloud-- that wow it has a lot of detail, but I just needed to know that this is the wall and this is the whatever. It's there and they can see it. If it had a material on it, maybe that's important, but more often, it's the geometry. And that geometry can then be used in Navisworks, which again, can handle tons of geometry. But do you want it to sit there and chug away on 50,000 polygons, when all you need is 500 to represent this model component? And break it into pieces, which is not easy to do in Civil 3D.

AUDIENCE: So you're optimizing the whole process in the scan?

MARK KAUFFMAN: Yeah. And it's one of those situations-- like if the top of that pillar right there, that is a really intricate piece of geometry. And while that could be modeled for the appropriate rendering that you need, it's not necessary other than to just kind of show it. If you need that, use a point scan and get a high density piece of geometry.

But if you need to get that wall? That wall is just a face and then there's this. This maybe needs a little bit of extra geometry. Do you need the hyper level of detail in there? Probably not. But you could model this really quickly and say spend 500 polygons to do this, as opposed to $5 million polygons for that wall. And use that as part of your asbuilt or whatever. And again, it makes it easier for the engineer who's running Civil 3D, or is running Revit, or is running whatever application that they're working with. They're working with a much more svelte model that they can tumble. I need to tumble, and you're sitting there going ehh.

AUDIENCE: Plus all the time for the field survey.

MARK KAUFFMAN: Precisely. Sure. I think we're way over time. Any other questions here? I might have a little extra time to show that workflow. If you have any other questions, please. Let me make sure to give you the right card here. If you have any more questions or you want to ask more questions, just take a card. You're more than welcome to email me.

AUDIENCE: Thanks alot.

MARK KAUFFMAN: My pleasure.