ANDY CARTER: My name is Andy Carter. I co-own a small civil engineering company in Austin, Texas. We're two years old. I am a Professional Civil Engineer in the state of Texas.

This is Gaming the System. We are going to try to tie every program that you've got in your infrastructure suite together to get some beautiful stuff. That's kind of the intent. So we're going to a little bit of Civil 3D. We're going to do a little bit InfraWorks, a little bit of Revit, going to talk about some game engines.

We're going to dive into one that's proprietary, but I think is really easy to use for those that are looking and shopping for an answer. I don't get any endorsements from them. I'm just telling you what we've messed around with and where we've gotten. And, at the very end if there's time, I'm going to jump into yet another game engine that I've just started playing with and show you where our workflow goes from there.

I speak really fast. I have gotten comments before at AU that Andy speaks too fast. I prefer to teach over people's heads or teach them fast and over their heads. Because what's going to happen is, in about two days, you're going to sit back and you're like, oh, I remember he said that. It's going to come by real fast.

I think the write-up's pretty solid. And I go through the workflow a little bit slower in the write-up. I'm going to mimic it exactly. The data set that I'm using is on the AU site. And you can try to replicate as much of that as you can.

I do this in all my classes-- big class, please turn your phones off. I get kind of thrown off if it rings-- or at least put it on silent. I respectfully request that you hold all your questions and interjections to the end. That kind of throws me off pace. I've run through this at my house about 8 times to try to make sure I can squeeze it into an hour. And if I get thrown off I don't want to lag, because I know you want your beer.

Let's keep going. I'm not going to read this. Y'all have read that before. I don't want to suffer through PowerPoint. I'm going to tempt fate and do as much of this live as I possibly can. I hope you appreciate that. It can either be a raging success or a gargantuan disaster. We'll see which way we go.

What are we doing in this class-- develop quick workflows to create compelling and cost

effective visualizations. I'm a five man firm. I have small budgets. I have clients who do not want to pay me for visualization. My goal was to create visualization with a high level of fidelity as fast as I possibly could. I started migrating toward game engines. That's why I'm going to show you what we did.

Let's establish a model based design-- we're all doing that now anyway. And you probably don't realize how close you are to being able to ingest that into something to make it very attractive and visually dynamic. Some of you probably do.

We're going to composite Civil 3D data coverages. We're going to use InfraWorks, not as a final product. And I'm slowing down to say that, mainly because I don't think InfraWorks is an end destination right now.

There's probably somebody on Autodesk whose blood is boiling when I'm saying that, but I'm saying, as of right now, it's not mature enough. It will get there. And there's no doubt in my mind it will get there. But, as of right now, I think it's an intermediary broker where we aggregate surfaces and coverages and get things together so we can take it one more step.

It was like you would do a rendering, and then you would move it into Photoshop. I kind of see InfraWorks as a place where you put all your stuff together, you export it, and you move it into something else for polishing, spit-shining, putting vegetation, materials, textures, that kind of stuff, on it. That's my workflow as of right now. I think that's going to change in the next five years. But, as of right now, that's where we're at.

Enough, for those who do I don't know there is a Infrastructure Design Competition that's done every year. These are the big boys. These are million dollar firms, these three, multi, multimillion dollar firms. This is us. This is CivilE. This is five guys that did a site rendering. And we did it without the client actually paying us for it, and it took a couple of days. And we won the Small Project this year. So, what I'm about to show you is the exact same workflow that we did to win this prize.

OK, we're going to a smaller site, granted, because I can't do a 19-building apartment development within an hour. But it's going to be the same exact workflow. Actually-- and I haven't really told anybody this-- we're doing this site, one right on the corner, which is a commercial, retail kind of outparcel. It's real data, real site, real survey.

So the goal is to get complex Civil3D designs into a game engine. We've already gone over

that. Everybody knows-- well, a lot of people know how the game industry works. And I think we're kind of running parallel to it. We don't realize it. They kind of do a three-tiered system.

I've got a friend that did the SMU Guildhall. It's a game development system. And they break it into three tiers. They've got artists-- guys that sketch up and draw models. You know, this is the way that we want things to look. They've got programmers at the far end-- guys that are cranking out code and making sure that the physics of things work, that the guys running down the hall write. You got these guys in the middle.

And this is kind of a niche industry now, but these are level builders. These are guys that are building worlds, putting things together, making sure that the three-dimensional level that we're running around is right, and that the curve is there, and the grade inlet, and that kind of stuff.

Strangely enough that's us, now. And we haven't really realized. I think we kind of stumbled into it. We're level builders now. Got your land planners who are doing your landscape architecture coming up with a big vision. The architects do that, too. Civil engineers, we get all that data, we get our hands dirty, and we build the level. Right, we grade it out. We say where the trees are going to be with the landscape architects input. But we are level builders now. Autodesk is kind of a programmer. They're the guys that are figuring out the code to make all this stuff work.

Why does it matter now? And you all know, I've-- HoloLens's on the floor. You've seen a lot of people with Oculuses. If you can create 3D content in real time, you will be king in two or three years. Because you can ingest it into systems that are being built as we speak.

So, the Revit guys have kind I've already taken hold of this. They've realized that they can dump it out. But if you can create compelling Civil work, you will be able to ingest it into some kind of real-time system, a HoloLens at Oculus, whatever you name it. It's all coming out in the next few years. That's where the hardware is.

So, we as civil engineers, architects, designers, we need to understand how to get our data ready for this tsunami storm. How do we ingest it into something where I can let somebody experience it on this level? It doesn't have to be a headset. This could be on a screen. It could be just a projection of it. But we have all the tools now.

OK, I'm going to get out of this, because I don't like PowerPoint, nobody does. So where am I

going to start? I'm going to start in Civil3D, as everybody does. And, actually, I'm really just starting a plain-Jane AutoCAD. So this is the site plan that we're dealing with. I've got pretty much lightweight, polyline, AutoCAD line work. I mean, it's just boring line work. That's the stuff that we start with. So we start with just a traditional AutoCAD land plan, 2D.

Where do we move from there? So the next step and probably the single most important time consuming and complicated step. If you are really good at grading, this workflow is brilliant. If you are terrible at grading, you don't even need to touch this workflow. So if you have a deficit in grading, grading is going to be your impotence to try to accomplish this task.

So, if you're not good at grading, you need to start investing heavily in understanding how to do feature lines, and infills, daylights, and targetings, and all that kind of stuff. And I'm not teaching that in this class, because I can't. I mean, I can teach it, but I don't have the time. But if you can't grade, you need to learn. And it needs to be contiguous. And you don't need to cheat, because I've seen a lot of people that do grading and cheat like, oh, we got this far I'm going to do the rest by hand. I think those days are waning, and it's going to be a problem later.

This is a 10th a foot contour site that I bammed out really fast. Technically, it's not ADA compliant. This site plan will not work. And I knew that, but I was just trying to get it done just so I had a data set.

So you can see a building slab. We've got some stairs. We've got some relatively mild but it's about a 5% grade. It's coming around that curve return. This is the surface that we're going to use and try to get it into a game engine for site rendering. We've got some stairs. That's the ADA part that's not right.

So I'm going to close that. And we're going to jump over to InfraWorks. And I've already built two things. The first one is I built the existing ground. I'm doing everything in Texas Central State Plane, which is what I deal with in my neck of the woods. I've already set all the InfraWorks up, and I brought an aerial. I am not using anything that's cloud-driven.

I don't go grab it from the model builder. I do all my stuff with the data that I can find. I feel like I get a better fidelity for that. I bring in the terrain, I bring in the aerial, and I get going. So what I need to do is I need to get my proposed grading out-- the detailed grading that I did with all my brake lines and feature lines-- and I need to move it into the existing site. Going to go back into this, and we're going to export that as an imx file.

So I'm going to go to the output tab, on the ribbon. We're going to say export imx file. And I'm going to-- back up a second, give me just a second. I'm going to set up a folder-- you can see how many times I've run it-- just to make sure I do this right.

I'm going to do a New Folder, and we're going to call this _AUrun08, make sure I did that right. Yeah, that'll work. OK. So I'm going to dump out this imx file. We're going to say export imx. And it's going to ask if we want to save it before exporting. I'm going to say no. I'm going to say d: colon-- nope, excuse me-- slash underscore-- this is the rough part. Once we get this, we'll be good. Let's see if that works.

And that's pretty fast. All right, it's gone. Surface is in State Plane, because we did all of our Civil design in State Plane. Our CAD line work was in State Plane. Everything's on the same coordinate zone.

So I'm going to jump back into InfraWorks. We're going to get that surface in. Go to the little ideal. Y'all probably know how to do this, I'm just showing you what I'm doing.

I'm going to import an imx file. I'm going to go find that folder that we just created, which is Run8. We'll find the imx file. We'll say OK. And I'm going to a graded site. We'll configure it. Right-click to configure.

This is the part that if you skip it you're going to be really unhappy. InfraWorks likes to do this convert to grid. I don't know if y'all have noticed that. For existing ground, that's fine. For detailed proposed grading with hardcore feature lines and whatnot, that's terrible. It's going to ugly up your surface. So make sure you uncheck that-- close and refresh.

And that's going to take longer than it should. InfraWorks is a little slow to refresh probably because I have too big of an existing ground surface, at this point. I'm not going to go through every refresh, but we'll let that gin as it goes. And let's see where we're at. It's going to have a bit of a time.

It's kind of hard to see. I don't know how clear it's coming up there. You can see that site is aggregated in. So it's stacking it on top of the existing ground. And InfraWorks has the ability to meld and merge surfaces and sometimes to your benefit and sometimes to your detriment. So how will you grade those edges is going to matter about how that ties in. And I think those that have played with it-- I see some heads nodding-- kind of know that.

Back into to CAD-- OK, old school AutoCAD hatching-- everybody remembers you couldn't have donut holes and things couldn't match and whatnot. InfraWorks, to my understanding-- and someone could correct me if I'm wrong-- you cannot have donut holes, right. You have to create like those old school hatching patterns for coverages. Same thing applies here. I don't have any situations like that. But for those that are trying to replicate it on their own projects, you're going to have to create closed polylines.

OK, we're back up. What we're trying to do is we're trying to create coverages to drape on that composite surface of the EG and the FG. And I want five or six of them to get this to work. It's going to be asphalt. It's going to be curb. It's going to be retaining walls, building slab levels.

So what we're doing is we're trying to use the coverages to drape and paint over the surface on a site. And as we stack them up on a site, we're trying to use that as an intermediary to paint, OK, this is where the ribbon curb is. This is where the asphalt is. This is where the parking stripes are. And we're using InfraWorks-- which is a very powerful tool to do that-- to effectively be the one to do that.

So what we've done here is we've taken that site plan and we've created closed polylines of all the things that we want to create coverages from. And those coverages will be draped on the composite EG and FG surface. First, what I'm going to do-- so I'll do a MAPEXPORT command, which is one of my favorite all-time Civil commands, because it saved my butt so many times.

I'll go to Run08. And I don't want it as reshape file. I want an SDF, because that's just a little cleaner between Civil and InfraWorks. It's not cleaner between any other two programs in the world that I know of. But between Civil, and InfraWorks, and SDF is kind of the way I like to go.

The first one I'm going to do is I think I'm going to call it 00_site. And that's going to be the property boundary I'm going to select manually. This needs to be closed polylines. Under the Options tab, Treat Closed Polylines as Polygons Feature Class, we're going to pick polygon. And selection, we're going to pick it manually. And I'm just going to pick that site boundary. And we'll export it. There's the first one.

OK, I think we've got six or seven. I'm not going to do all of them. I'm going to do a couple just so you can kind of get the point. Usually the first time you're like, what's he doing. The second time is, I kind of get it. The third time, you've got a mastery of it. So I'm not going to do things more than about three times if I have to on this tutorial.

MAPEXPORT-- second one we're going to do is asphalt. It's 02_ASP. Pick OK. Select manually. Pick the object. Treat closed polygons as polylines. And polygons and we'll say, OK. That's the second one. And I'll do the third one for the mastery.

So you can see the retaining walls-- they're hard to see. They're these blue beasts, as I highlight over them. There's three of them. So I'll do that one just to fini-- well, yeah, let's do that one. I'll finish it off.

MAPEXPORT, and we'll call this-- that's probably going to be like 0405. And I'm going to call this walls. We'll say SDF still. And I'm going to select it manually. We're going to say, Treat Polylines as closed polygons. Make sure that's polygon. Selection-- select it manually. And I'll pick one, two, and three. And we'll say, OK. I think we've got that one.

Now a little word of advice, if you're doing something that's got a vertical face-- and this is in the write-up-- I recommend that if you're doing a projected overlay of a closed polygon that you overshoot it. So if you've got a wall-- that vertical face-- you need to offset it a foot or so on either side. Mainly, so I can get that texture to drape fully down the face.

If you do it right on the top, it might get confused and not know where it is. That's something that we spent a little bit of time kind of overshooting. So for curbs, for building slabs that are vertical, for retaining walls we'll overshoot a coverage as we're exporting it.

So I'm going to jump back into InfraWorks. I'm going to add that site boundary first, and I'm going to do-- again, I'm going to bring in three of them. So we're going to have to suffer through InfraWorks refreshing three times. And then I'll jump past it, and we'll do it another way.

First thing I'm going to do is I'm going to import that coverage file. I'm going to do the site. We're going to say, Open. Right-click on Site, and say configure. We're going to make it a coverage. We're going to do a drape, closed polyline, polylines as polygons-- it should already know that.

And I feel like there's one other thing we want to do. That pencil, which is your material-- I like to just go in there pick color and pick something that's kind of close. We're going to clean this up later in post when we get into the game engine downstream. And I'll say, OK. And we'll say, close and refresh. And we suffer through InfraWorks refreshing again.

All right, that's just kind of the way that it goes. InfraWorks is not fast. It doesn't update quickly mainly because I probably have that aerial and that heavy EG in there. Let it do it once. I'll bring in the next one.

So I've got all this draped greenery within the limits of the site boundary. Because in the end we're going to get in a game engine, we're going to call that terrain and put leafy grass on it. But that's why all that is what it is.

And you can tell I've got a grading problem here. I'm sure somebody saw it-- that little spike. That's in the resource files. Sorry, it's just one of those things.

I'm going to add another SDF. We're going to add the asphalt. And we'll say, OK. We'll right-click. Say configure. Again, a second time you're starting to get used to it. Type is Coverage Area. We're going to drape it. And we're going to change that color. And we're going to make it an asphalt-y color. We're going to make it almost black-- it's something. I'll say, close and refresh.

So surfaces have a hierarchy in InfraWorks, and we all know that. You've got the EG. You've got the FG. And you kind of stack them up as to which one wins, which one's on the highest.

Coverages do the same thing. So grass is at the bottom, asphalts on top of that, curbs on top of that. Parking stripes are on top of all the pavement. You kind of work your way up as you go. And you can kind of see that hierarchy as we get in close-- and can see that that boundary for the asphalt is still asphalt. Grass is grass, obviously. I bring in building slab, sidewalks, retaining walls. There's about seven of them that I'm using on this site.

Let's bring in the retaining wall just so I can show you that one. And that will be the third one that I'll make y'all suffer through. We will do walls. I'll say, OK. We'll right-click on it, say it configure. We'll make sure that, again, is a coverage and it's draped. Coverage area, we'll do drape. And we're going to pick a color that's just dumb just so y'all can see it, purple. Say, close and refresh.

And I want you to look at the over-draping, the overshooting, that we're doing when we create a coverage and try to put it on a wall. I like it to be a little further and past the toe of the wall and extending a little further out. Anything that's vertical needs to do this.

Now InfraWorks when you apply a material can't really, very well map vertical faces. It kind of

smears it, streams it down. I'm sure some of y'all have seen that. When we get downstream into another program, it's going to solve that problem. So you can see-- let's see if I can get it right on top of it. It's a tiny bit of overshoot. I mean it's almost so subtle you can't see it, that it's kind of past the toe of the wall. It's important step, it's something that we fought. That's the only reason I keep beating on it.

Parking stripes-- show of hands who feels like they successfully have solved signage and striping on pavement materials? There's at least one, two, three, four. I mean, those that have played with it-- and we fought it to death. We were putting in like stupid things. We were putting in roadway alignments for parking stripes to try to solve the problem.

And I had this epiphany just in the middle of the night. I was going, it's a coverage, right. I mean, everything that's a right turn arrow, and a parking stripe, and all that it's just a coverage. So stop beating your head on it. That's all it is. You just need to go in AutoCAD and create effectively the painted area.

I'm going to show those that don't know how to do it really fast. I like to use Quantum GIS mainly because I'm a five-man firm. I'm cheap. And it's free, and it's good for simple GIS tasks. I'm going to fire that up, and I'm going to show you how I do parking stripes. And this is in the write-up, as well.

So I'm going to go to the graded site plan. Sorry, we'll just go to the plain Jane site plan. I'm going to do a layer isolate, and I'm going to pick all the parking stripes. And I've screwed something up in this file. So I'm going to turn layer 0 on, as well. I'm just going to explode that, and explode that. That's what's going to zero. Oh, going to erase, because I don't want that van marking.

And I'm going to explode that hatch, that ANSI 31 crosshatch just because that's technically a parked, painted stripe, as well-- going to do a map export. And we're not going to do an SDF this time. I'm going to do a shape file. And mainly, that's because I like to use Quantum to do the buffering. You can do it in AutoCAD Map. I just don't like doing a lot of geoprocessing in AutoCAD Map. I'm not comfortable there. Some people probably are, I'm not.

So I'm going to do a map export-- again, my favorite command. It's not an SDF this time I'm going to do it as reshape file. And we're going to call this stripe. And I'm going to put it under Run8. And we'll say, OK. It's going to say, I want lines. We're going to select them manually. I don't really need any of the data. I just want the line work. We'll say, OK.

Get into Quantum, which I already had open, going to add a vector file. We're going to browse. I'm going to find Run8. We're going to pick that stripe shaped file. We'll say, OK, and open. So, this is how fast it is in Quantum.

Geo processing tools-- we're going to do a buffer. I'm going to buffer it 0.2 feet-ish. You know you're shooting for a four-inch stripe. You know your cross stripes might be different. If you're really doing this on a high level detail, you might actually want to get your stripes in the right distances. I'm just trying to do them all on one pass to be done with it.

The buffer distance-- I'm going to do 0.20 feet. We're going to say, Output Shape File-- I'm going to put that under run8 again. And I'm going to call it stripe buffer. And we'll say, OK, and OK again. So everybody just understand what I just did, just buffered the line, right-- created polygons out of lines.

So if your land planner's giving you just straight lightweight polylines for your parking stripes-- and why wouldn't they, because that's easy. This is what you would do to convert it to get it to overlay on that drape surface. So, I'm going to close Quantum. I'm done. I won't go back. Discard that. I don't need to save anything. And we definitely don't need it open twice.

So if I go back into InfraWorks-- like I was saying, parking stripes are coverages, right turn arrows are coverages, stop bars are coverages, everything that's painted on to the pavement is a coverage. And it took us awhile to come to that simple conclusion. And I've seen, I mean, there are books written by Autodesk writers and they're showing you how to do parking lots and they're using repeating textures. And it just seems silly. You know, it's just a coverage. I mean, just let's get over it. It's a coverage draped on the surface. That's all it is.

So I'm going to add that shape file. And since that's a shape file and it was brokered through Quantum, it's lost its spatial intelligence. So it doesn't know what coordinate zone its on anymore. But we'll fix that, because I just happen to know it's on the same one. So we'll say, configure. I'm going to do coverage-- if I can find it.

Geolocation-- notice it's lost. I know it's on Central Texas State Plane, which is what we play in. I'm going to drape it. I'm going to pick a color. That color is going to be white-ish. That's fine. And we'll say, close and refresh. And it seems so-- when you see it, you're like of course, right? I mean, that's what half the stuff at AU-- you kind of look at it-- you're like, oh, that totally makes sense. It's easy. They made it easy for us.

So there's our kind of ganky-- I'd probably spend more time on my handicap markings. But there is effectively the striping. And it's just a coverage. That's all it is. It's pretty simple.

Next step, trees-- trees are problems. If you can create good trees that are beautiful on your site rendering, you get a beautiful rendering. And every landscape architect will always tell you that, right-- beautiful trees, beautiful renderings. I spend a lot of time on trees. I'm not going to spend a lot of time on trees in this tutorial. I like to have a different point per species.

And I don't know if y'all know but the Academy Award two years ago for Technical Merit-- you know you can watch Academy Awards and they get to the technical section, like they gloss over it in like 20 seconds. And everybody in this room it probably pisses off, because that's all the stuff that's relevant to our industry.

A guy will invent some camera-mounted gimbal that can stabilize videos that are shot, and he wins. Two years ago a group called SpeedTree won. And SpeedTree does fractalized algorithms for trees that are slightly, they're similar species but they're slightly different. And they're in every movie that you've ever possibly seen.

And the trees are beautiful and when you show it to a client, they don't go, well, that tree's the same as that tree, right? Or, they're slightly the same scaled tree. No, they're actually, genetically, slightly different because of the fractalized algorithm. And that's why they won the Academy Award. It's so simple.

But it's like, that's what I want to use. So I would look to-- if people are taking notes or writing it down, I don't think this is in the write-up. Anything that uses SpeedTree is probably a good thing just because of the way it looks.

So, InfraWorks doesn't use SpeedTree. I'm going to bring in trees in a very, very simple, watered down approach. I'm going to go back into InfraWorks. So surveyor surveyed all the trees. I went in and deleted all the ones out that we're killing, or I put it in a different point group.

These are all the ones that are surveyed to remain. And they're just the standard, AutoCAD-- they're Civil 3D point description key set tree, doesn't matter what it is. It's just a point. I'm going to say export Civil Objects as SDF. The only Civil Objects in this drawing right now are the point trees. Because if you do this and you've got surfaces and a bunch of other stuff in there, it's going to dump everything. So I'm going to say, export. I'm going to say, let's see--

make sure we put that under Run8. And, that's fine. Save, OK, Done.

Back in InfraWorks, we're going to add that SDF file. That SDF file is going to be for trees. We're going to add that. Right-click on point say, configure. Now keep in mind these are surveyed, positional trees. That's important. Because a lot of times we do renderings we just spray trees on it. In my experience, it's better to actually know where they are, to actually have a physical, contextual relationship as to where it is.

I'm going to pick trees. I want to make sure this is draped. Drape it, and I'm going to do a rule style. And we're going to pick a-- I like that tree. I don't know why.

Now, these are not SpeedTree's. These are the same static tree over and over again in the same rotation. And it's the same species at the same scale. You can write scripts to change species in scales, but you still got the watered down, InfraWorks-y trees with that alpha textured-- I won't get into it. I don't like them. But it's an easy way to show them and contextually in the right location. And you can always create your own object and ingest it into InfraWorks if you're a real good Max user and get something better.

OK, so that's what we've done to get InfraWorks to that point. I'm going to jump to a proposal that I've set up that is completed. And it's really not much more than we just did, just a couple of more coverages. But I'm going to zoom in so you can see it-- asphalt, curb, building, walls, sidewalk, and textures, trees.

So now I need to get it into something to start cleaning it up so I can ingest it into a downstream game engine. What I'm going to do-- for those that don't know this, it's pretty obvious. It's pretty simple. I'll go to Settings. And there's this export on the left-- I don't know if you can see my cursor-- Export 3D Model. And that will export an fbx file out of InfraWorks that we can get into a game engine.

And that's going to look as ugly as we've created in InfraWorks. But it will be able to ingest in of the third-party real-time Viz system. Do a bounding box. We'll do that. And I'm actually going to export this. And we will import this into Max.

And I want to show you a problem that we've recently run into that I've been talking to some guys at Autodesk to try to solve. We're going to skip a step, because I wasn't able to solve it. I just want to say it in case y'all run into the same problems. And I think I know what the issue is. And anybody that's not in the United States is probably not going to have the issues. So that's

a hint.

Export it. Make sure I put this in the right place, because I have a tendency to not. We'll do D. We'll do Run8. And we're going to call this Site. Take that T off. And we'll say, save. I just want you to see how long it takes, because it's really fast. I mean, it's a pretty-- even with a detailed EG surface, it's still pretty fa-- it's done.

So let's go into Max and take a look at what we just exported. So we'll say, File Import. And I'm going to import desktop-- if I can find the D: drive. I don't want to change the name of the drive. I just want to grab the file. Come on, come on-- Site, Site.fbx.

And this really irritated me when I did it the first time. I got bonsai trees, little, tiny trees, right? And I think what it is is that I'm in a foot unit and it's a metric issue. It's because everything seems to be scaled about a 0.30.

So if you're bringing in assets that are native to InfraWorks and you're working in a coordinate system that's in feet, I've seen a lot of the assets scale. Strangely enough, I didn't see this problem in 15. I saw it in 16. And I don't really understand why. I've actually got 15 installed in my office, 16 installed on my laptop, and I saw it here first. So I'm not sure what's going on. But I have seen it.

So I just wanted you to see it. So if you're trying to replicate these workflows and you say, I don't have a solution for it other than go get the old version. Use it or do everything in metric-- for the guys that are in European countries. They shouldn't have this problem.

But there we go. So, everything's in Max now. I don't have the building. So where do I get the building. I pick up the phone, and call the architect, and I go, hey, where's your Revit model, right? And they go, oh, we don't work in Revit. And I go, I don't work with you anymore, and I hang up the phone.

[AUDIENCE LAUGHTER]

But, I mean, it's funny. But it's kind of getting to that point, right? If you're an architect that's not working in Revit, why are you still in business? Right, because you shouldn't be, in my opinion.

I'm going to jump over-- it's just like a Civil shop working in LDD, right? You're a sinking ship. You know. The boat is burning.

Let's go back over into Revit. So, in this case, CivilE built it, because we didn't have the Revit model. We actually are lucky enough to have a guy on staff that's a Civil designer, that actually knows Revit, and knows it decently. I don't. I'd like to, but I'm running a business and it's kind of hard to delegate my time. So I'll yield to him.

But he built something quick and dirty off of the floor plan that we thought the building was roughly going to match. So there's the Revit model. So I need to get it ready for someplace that we want to show it off. Something that looks a little bit of higher fidelity than InfraWorks does.

I'm coming back to Revit. I just wanted to show you that we'd actually have that model. I'll make a jump back.

So, here we are in Max. And I told you that I kind of have to cheat here and jump back to the one that was exported out of 15. But I just wanted you to see the problem. It's going to say, New. We will not save that, because that was just bonsai tree nastiness. We will import the file that I know is correct, which is going to be that one. And let's take all the defaults out of Max. So this is pretty much the same thing coming out of InfraWorks.

Now downstrea-- so, I didn't pick the textures that InfraWorks has. I picked just a random color off their color wheel. Do y'all all notice that? When I push this downstream to a game engine, it's going to call everything Material 1, Material 1, Material 1 Parentheses 1, parentheses 1.1. It's going to give it a horrible, terrible names that are going to make my life incredibly complicated when I get it into a game engine.

So what I'm going to do-- those that know Max-- I'm going to do this if I can find it, M. I like the Slate Material Editor probably because I haven't been in Max very long. I am a novice amateur in Max. I get in, and do what I need to, and I get out. I don't do any real creation there. Hopefully that'll change in next few years.

Pick that first material. Simply go over and just change it to the name it is, asphalt, done. And I'll do that six times. So I'll do it two more for y'all. I'll pick the grass, double-click on that material, change its name to grass, done. OK. And I'm going to do the ribbon curb the third time. Maybe I'll just do the wall. Pick the wall, and my slate's just getting ugly as hell. But it doesn't matter as long as I've got the names. And we'll call that Wall, right?

So what does InfraWorks do strangely with fbx files? I mean, it doesn't hold state plane

coordinates in your x and y. But it has a tendency for us to hold the z, right. So, everything's up. And in this site, it's up in 600 feet. It's not-- the pivot point, or the model itself, are real far apart from each other, which is pretty normal. You just have to clean it up.

And the way that I do it-- so once I get all the materials' names, the way that I move that model and move it to a place that's a little bit more normal, is I'll just take that rectangular box and pick everything. I will unlink it, and I do it twice. It's like purging. I kind of feel like I have to do it twice even though you probably don't really need to. And then I'll move it.

So I'm on the move command. I'm sorry, I skipped a step. I'm going to group it. I'm going to call it Site. We're going to put everything in one container. I'm just going to tie it all together, and then I'm going to move it. And right now, you can tell it's at about 200, 276, and 646, which is the actual elevation.

The x and y is wrong, because it's trying to water it down, get it better to be a little bit higher fidelity in Max. But I just change all those to 0, 0, 0, just to get it more normally back into a spatial realm of reality. Then I'll export it, and I'll say File, Export. And I'm going to call it-- man, I put things in the wrong folder all the time.

I'll say, this PC, D: drive, Run08-- and I'm going to call this, Site, maybe, move, just so we know it's moved. And the materials have been corrected. I didn't do them all in this one. But we would have renamed all the materials to grass, walls, asphalt, ribbon, curb, etc. So we moved it. We'll say, OK. Save it as an fbx file, pick all the defaults, and get the crap out of Max, right, because I'm not good there.

So we've done all that. Now we go back into Revit. You know what, we'll skip Revit. Revit will come.

So, where am I going now-- game engines. There are few out there that are free-- Unity, Unreal. I don't know about Cry. I haven't really kept up with it. I don't know if they've realized that they have to compete. They're going to have to go free eventually.

There's a new one on the market, new boy in town. You probably heard of it. It's called Stingray. That's Autodesk's. They bought one and branded it. And I think they've got an interesting marketing angle, because it plays really nice with Max and Maya. And I don't think-- I think you subscribe to it. I'm not sure how their licensing works. So I'm kind of curious to see if it catches on. We'll get there.

That's not where I'm going to go. Where I've gone-- and we beat our head against it-- is I'm using a product, that is a proprietary product and they are on the floor at AU and I talked to them yesterday-- called Lumion. Show of hands, anybody's used it? Great.

InfraWorks and Lumion are our best friends, which is interesting because Lumion isn't marketed that way. It's marketed for architects. But it works really well with stuff coming out of InfraWorks, I mean, like obscenely well. And I don't think everybody's noticed that yet. Maybe after this class, you'll be my disciples, and spread the good word, and the word will spread, and we'll all know soon. But it is a very powerful program for rendering with a very shallow learning curve. So it's worth looking into.

And we're going to get in it, and I'm going to show you how I do my workflow. Oh, that's not-- that's Stingray. We'll get into Lumion. And this one I'm nervous that I'm going to have a licensing issue. Make sure-- I'm going to plug-in their network cable, because it's probably going to gripe at me. I just saw that. If not, I'll tether it into my phone. It's a cloud license. We buy one for the company. OK, good. We're in.

And I'm going to go through this really fast. Again, I speak really fast. I show things really fast. Sorry. I'm going to import-- yeah, OK. I'm going to import a file. And I can import that fbx file that we created out of InfraWorks, that we used our site design, and aggregate, and put all our coverages on, and put our trees in, and I'm going to import that in. So that's D, and I'm going to cheat and do one that I know I fixed right. And we're going to call this, Eight. And we're going to-- Import Animations, there aren't any, doesn't matter, going to bring it in. It's going to load. It's going to think. It's going to churn.

OK, there's that site. There's a big arrow saying, put the thing here, which is really helpful. And there is our site. So I'm going to move it up just to make sure it doesn't include it in the ground. But notice the aerials are transferred over, models transferred over. And this is really easy. This is why I love Lumion.

Pick the grass, pick the terrain. Everything's now grass, done. Everything that was that green overlaid coverage is now grass. If I want to turn the grass on, which I do, we'll make grass. We'll turn it on. We'll do grass size, grass height. I'm going to make sure that the settings are all the way up.

So, see all-- it's just like Cry. It's rendering every leaf of grass. Pretty cool, pretty slick, I think.

And that's what we design.

So, I'm going to go through and start painting some other stuff. I'm going to do this as fast as I possibly can just to make a point. We're going to do outdoor asphalt. It's got bumps and does ray tracing well. There's our asphalt-- going to do some concrete, outdoor concrete. Pick that. We're going to a ribbon curve. We're going to that same outdoor-- and these are all loaded. And I've got the Lite version. I don't have the full version. I've got the Lite one.

There we go. So, pretty close. I guess the only thing I'm missing are the retaining walls. Let's do those. Go outside. We'll do an outdoor. We're going to do stone. And I'm going to pick something that the city of Austin likes, which is a rough cut, limestone-y looking stone.

But notice that's applied to both textures. Nice thing about it is, I don't have to dick with UVW maps. I don't have to dick with mapping. Its handling. Its handling that vertical face mapping without me having to fight it. It's done.

All right, so I don't have a building, right? That matters, matters a lot. So I'm going to get out. I'll keep Lumion live, but I'm going to go over to Revit. And the Lumion folks have made texturing their buildings really easy. They have got a COLLADA file converter. You don't have to use it. You can use a Revit to fbx. But I like to use the Revit to COLLADA, because it retains texturing and retains it really well. So I'm going to do. That that's their add-in. I don't think they charge for it. They charge for the program, but I don't think they charge for their add-in.

Export to Lumion, collect textures. We'll say, Export-- going to call that DRun3. We'll do that building.dae for COLLADA file, which should not take very long. Done. We'll go back into Lumion. We're going to bring in that building. And-- if I can find it-- so I'm importing a custom object. And I want that building that we put under Run8, so you make sure that I'm doing all this live and trying to not can much of it.

Where do I want that building? I want it here. All right, now I've got that Revit building in-- going to rotate the site up. And I'm not going to be a real spot on. But I'll be close. Yeah, it needs some rotation, but that looks close enough. I'm going to push it up just a bit.

I'm going to spend about 40 seconds texturing it, which is kind of nice. We'll paint it. That stone-- I don't really like the stuff coming out of Revit. I want outdoor stone. I want all that gypsum board to be like a plaster and kind of a peachy color. I want all that glass to be glass. And there we go.

So now what else do I need? Well, I need some cars. Let's get some cars in. I want something with a good, visual high fidelity. It's going to place some objects. And again, this is just a game engine. It's just a proprietary game engine for architects. And I like it because I feel like I can do a lot without a lot of effort. And I can teach a lot of people to do a lot with it without a big, steep learning curve.

So I'm going to put some cars on it. Those are all pre-canned. And this is going to be pretty fast. It's Texas so we're going to put 100% pickup trucks on it. So that's-- oh, I messed that up. I'll back up just a second, and I'll explain what I did wrong. So I actually want to use this tool at the bottom, which is Mass Placement, which will put multiple cars down in a parking lot.

And I think that's 1, 2, 3, 4, 5, 6, 7. That's eight spots and I'm doing it center to center. I want eight of them and I want to rotate them so they're kind of all in place. OK. But the cool thing is I can go in there and add stuff and it randomizes the cars and the colors. So I can expand the library as I go.

I don't know, renderers always put high-end sports cars in it, and I think that's ridiculous. I always look at all these beautiful renderings. There's Ferrari's in it, and I never in my life drive by and see a Ferrari anywhere, so.

We'll pick up one more just to make the point. All right, so now we are done. And I'm going to do the other parking stalls just to make a point as to how fast it is. And we're going to do to I think that's eight. It's either eight or nine. Let's see, nine, OK? Done. And it's striped against the graded terrain that we did, right. So all those cars are actually morphing to the surface underlying it, which is really a powerful thing. We'll do three here-- uno, dos, tres. And push it down, OK.

We got 15 minutes to go. And we're getting pretty close to having something pretty cool in about 30 minutes. Right now, I [INAUDIBLE]. It's cheating a little bit. But you could do this in a day, which is really powerful.

Obviously, you don't want to make it look like nobody can park at your site. So we'll just cull the herd. Take out all the Volvo's that seem to be driving into Austin every day now. That's it.

Now we could add stuff. We could add dumpsters and fences. I'm going to show you one tree just to show you the difference between an InfraWorks and a SpeedTree tree. And SpeedTree, remember, is fractalized and genetic. So, we'll do Crepe Myrtle, because the city

of Austin seems to think those are electric-friendly, for some reason. I guess they can tear them out or something. I don't know.

OK, so you can see that the visual-- oh, too far, I'm making everybody sick. That visual fidelity is seeded, right? And it's a little cleaner as far as its texturing, materialing, shadowing, or tracing. Then a InfraWorks tree.

[LAUGHTER]

But the cool thing about the InfraWorks tree IS that I can use a GIS logic to put them in. There are workflow tricks to get Lumion to be able to put a tree on every block. And it's a more advanced workflow that I don't have time to show right now, but you can do it.

What can this program do at this point? Well, it's got filters, and you can make things look sketchy and whatnot. One of its most powerful features for us is I can drop a picture in there, and I can export an e-mail.

I can even print out a 4K image. And David Gonzales is in the back, and he's with CivilE. And we've printed out a 4K a image and hung it up on the wall. And it looked too good I mean, it really did. It was like, it's too big, and it doesn't look right. But if you're at a public forum and you need a big banner and you've got to show somebody something, you can export a 4K image. And it's not bad.

I'm not using-- OK, before I get into the last thing, and the last thing is probably the coolest thing, save it. Save dessert for the end. What can a game engine do that Max can't do? So I'm going to proselytize a little bit.

Game engines can do all this stuff in real time. I can move around. I could pull this laptop up, throw it in front of City Hall, City Council, Planning and Zoning. I can move, and zoom, and adjust, and go anywhere that I want, and show in real time.

Have a client-- the one that we won our award for-- that's got 19 buildings, multifamily project, many of those units are subterranean, meaning you're walking in on the second floor. There's a retaining wall, and you're looking out of the first floor. I can zoom to any unit and show them what it's going to look like, right. So that's a very powerful thing to be able to, in real time, move around.

And as asymptotically, real time shaders start to approach render farms, 20 years, maybe

render farms are dead. Maybe we don't use them anymore. That might be where the future actually takes us, because I can see the two approaching each other faster than I thought was going to happen-- about real time ray tracing, and shaders, and how game engines cheat to try to approximate. I really do think there's going to be a convergence. And, at that point, we're not going to rendering in Max anymore. I could be wrong.

But that's kind of what I see the world trying to get to, and it's just a matter of computational speed, right? You're going to laugh, but probably in 10 years I'm going to have 700 cores running on my PC. It's effectively going to be a render farm in itself. And we're going to try to use that in real time. I think that's where it's going to go. But, I think real time is the future. I mean, you can ingest and use it where you want.

So, I can create stills out of this. And, by the way, that asphalt looks like crap. Doesn't it? Let me go back into the model and try to fix that, because I want to make a point on how easy some of this scaling actually is. Paint, asphalt-- so I don't like the color, or the gloss, the reflectivity, or the scale, or whatever.

I just mess with the scale till it doesn't look like that kind of pattern texture, right, more granular. That bump starts to show up, and it looks more asphaltic. I might have gone a little too far, but there is the site, all right. And I'm just flying around it like I'm in doom or quake, all right. And I'm using W-ASD and the mouse, and I'm just flying around.

So the owner is like, hey, Andy, what's that wall going to look like on that side. And I go, well, we look like we've got about a four foot slab exposure over there. Or how about that retaining wall on the property interface, what does it look like? Well, it's about two or three feet. Well, I don't like it. Can we get rid of it?

OK, quick story time, them I'm going to do the dessert. We did the model that we won the award for, and I showed it to a client. The client is a big multifamily developer in Austin. He's been doing it for 45 years. He's in his 80s, and is just a cantankerous, crotchety old man-- wildly successful, brilliant man.

And I showed them this model. Now, keep in mind, he's been doing this for 45 years. And he already knows what the site's going to look like, because he's been doing it for 45 years. And I show it to him, and I'm real proud of it. And he goes-- and he's a very kind of crass, rough around the edge Texan, right-- Yosemite Sam, shooting his guns up in the air.

And he goes-- and I apologize if this offends anybody-- he goes, goddamn it, those roofs are the wrong color. And I stopped, and was offended for about a quarter of a second. And I realized, that is the greatest compliment coming from him. Because he's looking at the model, and the model is real. It's real grades, real trees, real locations, real cars. And the thing that's wrong is in his mind that roof tile is supposed to be slightly less red, all right.

It's a great compliment. Developers never see it as right. They always see what's wrong. You just got to get them as far downstream as you possibly can. And if you can use this workflow, you could actually get your real design to actually get it into a site.

So all those fbx's we created-- we created one for the site, one for the building, right? Remember those? And we brought them into the Lumion, because it's learning curve is shallow and it's really quick and easy to use. Where else can you take it? This is dessert. I'm not going to do it in Stingray. I promise and I swear-- Bible, heart-- I did all this in Stingray, and I did it within a day and a half of me never seeing it before. That's how easy it is. And I'm not going to go through the workflows, but all those fbx files can be moved over into any game engine of choice-- Unity, Unreal. And all those texturing layers and coverages that we did, they're all going to work that way.

This is our game of the same project. We got super awesome mode at the bottom, which does absolutely nothing. But it's fun to click.

So we're going to start it, and this is it, right? Look familiar? I didn't spend a lot of time messing with the materials like I did in Lumion. But still I got red guy, I got stairs.

Cool thing is-- oh, by the way, I stole these cars out of InfraWorks. They're SSSF files or something. I don't know what they are. You can steal them. You can use them in other things. It takes a little bit of-- well, I can tell you what you do is you create one point. You bring in that object. You export it as an fbx file. You move it into Max. You delete everything out but the object. And you move that fbx object into any game engine that you want. You now own everything in the InfraWorks library, which you don't really want. But the cars aren't bad. They're not bad, right.

So there I am on the car. I created collision objects, physics objects. So the guy knows that he's running into the building. The building is a thing.

I do want to make a point in the sense of these fences are alpha textures. And those are

actually out of InfraWorks. The trees I actually turned the physics objects off, because I don't want the guy actually hanging in the tree, right. I don't want him to jump and get stuck, kind of ganky, but it is a little cleaner.

Keep in mind those trees are surveyed in the right location. This is the graded site, right. And I had this like funny wanting to run a game just to have ADA man and have him drive around the site and go, no, you failed. I mean, literally though. You're driving down it, and he goes, too steep or too much of a cross fall. You could actually have a game object do that as you drive it and it goes, fail. The grading didn't work, especially right there.

It's one of those things you don't subtly pick up on. I did a little bit of-- I stole some grass just to kind of show you that, yeah, you can do that. And then the coolest thing is you can shoot your site, right.

This is all pre-canned, Stingray template. The guys in there. I didn't have to do him. The animations already there, not that I really need that. But they have a plug-in for an Oculus. So now I'm telling you what I'm getting for Christmas. I already told my wife, is that I'm buying an Oculus when it goes commercial, which is actually after Christmas. But because I see that I can just plug this in and we might be able to have some experiences on a very affordable budget, we can create this stuff and use it for what we need to do.

But David again, at my firm, he's down at the other end of the hall. And when I get angry, I boot this thing up and just start blasting that site. Oh, that client was a jerk.

But, not that you need to create a game of your site. But what I'm really trying to explain is that you can use a game engine to show an interactive experience of the site itself, with true, accurate grades that are detailed from Civil 3D that are created from corridors, which I didn't do but you could do, that all of those surfaces it's just a game of aggregating EG and FG in InfraWorks, overlaying coverages for compositing of texturing, bringing it into a game engine, and making those textures look beautiful. That's the workflow, right. That's it.

So I'm going to jump back into-- I've got to quit this, because that's a lot of fun and I waste a lot of time there. I'm going to go back into PowerPoint, and we'll do our mop up. And then I'll take some questions, and then we can go get some free beer. I'm buying. I'm not. Augie's buying.

Let me just jump through this. And I have not put the slides on the-- I haven't uploaded them

to the site. Mainly because I don't want you cheating and looking at your Christmas presents before you see them. Quick word-- this makes me really sad. And it used to make me really excited. I'd see a graded surface, I was like, yeah, graded surface-- looks awesome. And now I look at it and I'm like, this is an awesome, graded surface that doesn't have any texturing or materialing applied to it, right. Now it makes me sad.

I'm going to go to the very, very end. And we talked about all this crap, so we're good. That's exactly what we just did. There's my shooting man.

All right, fill out your survey. If you like me, they hopefully will ask me to come back. If you hated me, don't fill out your survey. It's pretty simple. Theoretically, they record all this and upload it. I hope they did, because I like to go back and watch it and realize what I did wrong. I like feedback. If I spoke too fast, put it in the comments. I get it every year. He spoke too fast. I couldn't understand what he was saying. I get it every year. I kind of like having it. It's a badge of honor. So someone please put it in there.

But put like a just kidding, because if I get like 900 of them they're going to think I'm, I don't know, that guy from the Micro Machines commercials. Anybody knows what I'm talking about? That's it. So questions, and then we can go get some beer.

[APPLAUSE]

Thanks. Oh, and I got door prizes, too. So I'll do those as well.

AUDIENCE: Have you tried exporting into Adobe?

ANDY CARTER: We started with Civil View as a broker. We thought that was going to be our end destination. And it ended up having too steep of a learning curve and taking too long.

AUDIENCE: [INAUDIBLE], other than that has your import helped you--

ANDY CARTER: We have. We don't use that as our primary workflow mainly because it's too Max intensive for us. And we're not a Max firm. But we have played. We have.

AUDIENCE: The cars are probably a little bit better.

ANDY CARTER: Their car library is way better than InfraWorks. But once you get the shaders on them in Max, they're not bad. They're really not bad. Sir?

AUDIENCE: Yes, hints for [INAUDIBLE].

ANDY CARTER: We haven't pushed the limits. We haven't. I think it's going to be more of a level of detail issue. And if you can decimate your EG, and maybe InfraWorks maybe does that better. That seems to be where the biggest losses and gains are that we're seeing is the accuracy and the fidelity of the terrain. Everything else is relatively light. It's the terrain that's the killer. So you've got to figure out where that balance is for your site rendering.

We did do 20 acres, and it worked fine. We did not do 200. We are looking at doing a single family subdivision in the same workflow and that one is 200 acres. I don't know if it's going to be stable or not. It just depends on how detailed we want the existing ground to be. Any other questions? Sir?

AUDIENCE: Striping on roadways-- you had solid stripes there. What about broken lines?

ANDY CARTER: Broken line-- all right. Anything that's painted on the ground is a coverage, right. So you'd probably-- in my workflow, I would draw those broken lines as broken lines. Or I'd draw on an AutoCAD line that's broken and somehow try to explode it to the point where it's actually just a line work itself. Is there a better way? Maybe. You notice InfraWorks floats it right above the-- I hate that. It's driving me nuts. It's like, why does my paint stripe have shadow on it.

But, no, my workflow would be more-- like I exploded that hatch-- I would try to water down that stripe line to a point where I could buffer it and then ingest it, if that make sense. Anybody else? Back there?

AUDIENCE: What's the process for getting the game in the clients' hands, external [INAUDIBLE]?

ANDY CARTER: Like if you went to the exe to run it?

AUDIENCE: Right, I know some people believe it's [INAUDIBLE].

ANDY CARTER: Yeah, yeah, I think it's got a lot of resource files that aren't necessarily encapsulated with the install pack. But I'd give them that folder, as well. What I showed you is a standalone exe. That's not in Stingray. That is the exported exe from Stingray.

And Stingray will ingest into-- you can get a development kit for Android iOS, Xbox, PS4. I mean, you can actually port-- we could port our site over to that. We haven't done it, but we could. Stingray does that. So does that help? Anybody else? Sir?

AUDIENCE: It's more of carry on that. With the gaming engines, have you tried to engage in [INAUDIBLE]?

ANDY CARTER: I'm a novice in game engines. I am.

AUDIENCE: I knew it was [INAUDIBLE].

ANDY CARTER: Oh.

AUDIENCE: Any [INAUDIBLE]?

ANDY CARTER: I first started with Unity, and I fought it. And I didn't really understand it. And its interface was a little clunky to me. And then I jumped into Unreal. And I was like, whoa, it looks way better in Unreal. Because I just like the way its shaders work, right. It just looked better. And it was easier for me in Unreal than it was for Unity. And that's just me. I mean, I don't know. That's just me. Stingray, for me, has been the easiest. Because I'm kind of like an Autodesk goob. I just use everything that they do. And it seems to be pretty standard workflow, pretty obvious how to do it, how to export an exe to get it out.

So where am I at right now? If you ask me today, I'm on Stingray. You ask me in two weeks, I might be somewhere else. I don't know. I don't know where the easiest way is going to be. And that will probably change as time goes by, I think. Anybody else? Sir?

AUDIENCE: What's the difference between [INAUDIBLE] exports and [INAUDIBLE]?

ANDY CARTER: Hmm, good question. I don't know if I have an answer for that. As far as what's different, mainly, well, all I'm using in Max is to move it and change its material names, just so when I get into Lumion or something it says grass and not Material 1.1, because I'm picking off of that color wheel.

But I bet if you play with InfraWorks and you do the materials there, it might handle the material assignment better in naming. I just don't do it. I am only using the stuff coming out of InfraWorks-- I'm sorry-- out of Max mainly just to move it and rename it. And that's it.