

PAUL C All right, so welcome to the CIM workflow with Scan Data class. Last class of the day, right?

KIRKENDALL: Free beer after this. So I'll try not to go very long. I'm Paul Kirkendall, and all and I'm from Master Graphics in Wisconsin. We're a reseller of Autodesk products. Before that, I came from a civil engineering firm/architectural. Integrated them from, yeah kind of, from land desktop to Civil 3D. Took the survey department, I went down there and brought them up as well.

So I really enjoy the proof of concept-type things, understanding the workflows between different people. So that's what brought us to this. Also, Kelly over here is going to do some of the scan portion of the presentation today, all the Scan Data. So he'll come up after me. Class expectations. So we're really going to go through the workflow to resolve large data issues. Point clouds are really big, obviously. And we've always had issues with getting them into other softwares.

So that's what we're going to go through. It's kind of a beginner-ish level class. Need basic knowledge, obviously, of things. Please just silence your cellphones. I don't care if you play with them or anything, just don't let them ring. And then we'll have, hopefully, plenty of time at the end for questions. So save them to the end. I've got prizes at the end, too, so you want to save them to the end.

Class summary, I think everybody has went through that. And I really don't want to have to read that again. So I won't. At the end of the class you will learn a lot of things, how to bring in scanned data into recap. We're going to go through InfraWorks, some design proposals or options InfraWorks. Also the geolocation of the Scan Data so we can use it in InfraWorks in real time so it goes to the right place.

And then we're going to use Civil 3D to create proposed design. I'm not going to go through the proposed design portion, other than bringing in a recap model and the InfraWorks 360 stuff as well. And with that, I'm going to let my man Kelly go through his portion of the Scan.

KELLY JOHN Thanks, Paul. So were any of you in the Scan Data fact or fiction class down on the third floor before this, where they were talking about scanning buildings and things like that? Anybody in that? OK, well I had two issues with that class. They talked a lot about scanning. And issues not necessarily a bad thing. He talked about reality capture-- Casey, the gentleman that was presenting-- talked about reality capture and how that doesn't quite accurately represent what

we're talking about.

He was stating, literally, that we're not necessarily capturing sound, and taste, and feel, and all those sort of things. My only issue is that it's on the first frickin' slide of my presentation. So I was right away like, great, all right. If anybody was in that-- but it doesn't seem like a lot were there, so I'm in good shape. Again, my name is Kelly Kaepernick. Been with solutions consultant with Master Graphics. I've been there for about a year.

Prior to that I worked for 15 years at a fully integrated health care design build organization. We had everything all, literally, under one roof from civil, to architecture, to all the engineering. I was a BIM manager, CAD manager. Prior to that I was a product coordinator. So I had a lot of time in all the different areas. And being all under one roof was really pretty unique, in that it just really doesn't happen like that. And then we were also concerned about construction, obviously, because we did it as well.

So we were really focused on not just little parts, we were focused on the whole process. And I think that's where I started to really gain an appreciation for when I'm learning something new, I need to step back and look at the entire process. So this class is about the workflow. I still do it even though I know I don't learn this way. I still dive into an application and start clicking on buttons. I don't know if that's because I'm a guy or what the deal is, but it makes it really hard for me to really understand how it works.

A lot of the technology nowadays, they've engineered it to work in a way that you think, or they're attempting to, anyway, as best they can. So if you understand the concept of what the applications are trying to do, and what you're trying to do overall, you're going to be in a much better position. So I'm going to keep stressing that in my portion. And I'm also going to stress that this is a lot about efficiency.

We're all working fast. We're all trying to work faster. Time is money in our industry. But hopefully, we're not doing that at the expense of quality, at least knowingly. So how can we work faster, work smarter, not harder and all that, all those buzz phrases you keep hearing. So what is reality capture 3D Scan Data? I think it's pretty self-explanatory what they are. Reality capture is kind of an umbrella term.

It really-- in this industry I feel like, more than most, we grab a term and then we just hang on to it. We say, this is this, and that's how it is. BIM is civil. Well, if you break it apart, it's building information modeling, as Paul will tell you. That's why we're calling it CIM in this class. And so

it's one of those things that I think we all know that we'll throw these terms around and that sort of thing. 3D Scan Data, this stuff is general terminology. But I think it's pretty obvious what it is.

We're trying to capture the real world around us and bring it into a technology that we can utilize that efficiently. So the benefits of scanning, I think it's pretty well-publicized these days what the idea is behind that, behind scanning. You're trying to reduce the time of on-site visits and inspections through the capture of high resolution existing information. Now, if you haven't played around with any point clouds or that sort of thing, maybe the high resolution thing is kind of a shocker to you a little bit.

But it really can be. You can break it down in a way where you can get a high resolution. Some of the scanners, nowadays, you're getting a high resolution photograph with the point cloud data. So a lot of information coming along with it making your up-front processes easier. It allows you to design and context, so you're actually designing in the real world conditions. At least with a snapshot in time, that was another thing that came up in that class.

It's the snapshot in time of that condition that you're working on. You can measure distance, areas, and volumes. And it doesn't seem that a lot of people understand that. You think you're just getting a cloud, you're getting a picture with it and that sort of thing. You can actually get accurate measurements, distances, areas, volumes, and all that from this data as well. So another thing that I think is not well known is you can monitor the construction progress.

I've actually personally been involved with a situation where that would have been huge, had we been kind of taking scans of the project at certain intervals of whatever we decided were the best. We could have saved ourselves hundreds of thousands of dollars and issues, legal fees, and whatnot, had we been capturing that data as we go. Now, all of this stuff is going to be relative to your projects and what you do.

I can't get real in-depth and real specific about a lot of stuff, because it really just depends on the project, your company, your set up, your hardware, your software, and all that. So we're going to try to dive down a little bit. We're not going to be so basic that you're falling asleep. If you are, Paul's got a foam dart gun back there that he'll fire at you. And I'm not going to get too crazy over the top with it either, that you're going to be, this doesn't help me, because I don't even know what you're saying.

Again, from my perspective, I want to look at it from kind of an overview. And I want you to

understand what the steps are so that when you start digging into recap or any of these other applications, that you understand where you go on with it. That's one of the things that I feel like really gets lost in the industry today. It's just go, go, go, 100 miles an hour. So first thing, again, another thing that I feel, personally, gets scrapped in a hurry is sitting down with your team and planning.

Whether I'm talking about the BIM process for utilizing Revit on a project, or any of that, building projects, the first thing I always recommend is sit down with your team, whether you think you know everything about the project or not, it's good to sit down and get everybody's opinion. Understand where it's going. Understanding what are the client deliverables. Maybe they don't even know exactly what they want. So sit down, talk about what are we doing with this project overall.

And then you can start talking about how can scanning the project and capturing the reality of that, and going forward, how that can help with that. What are your end goals is another planning step. So for instance with this, we did the project. We did the scan. That wasn't the end of our goals. The end of our goals was, hey, you know what? We can make a nice presentation out of this to show people, share the information. And that sort of thing.

So that's another thing that you could sit down and talk about what are we trying to do with this. Maybe it's a marketing thing. Maybe you want to kind of show this is, look, I know what I'm talking about. We know, as a company, what we're talking about. Point cloud reaffirms that you know what you're doing. What are the budget restraints? I don't even know why that slide's up there. Nobody has that problem. It never comes up, right?

Nobody ever has money problems. Nobody worried about that. The thing with that is Scan Data and laser scanning, however you want to say it, that gets scrapped really quick when you start talking about the budget. I think at the end of this class, hopefully, you'll have a better idea of how it can be more efficient, and therefore better within the budget. So you know, again, I don't know what your company exactly is doing. I don't know what your project is exactly doing.

It depends on what you're trying to pull off, what your budget restraints. But hopefully you can utilize this information to streamline the process. And finally, how do you acquire the data? Do you own a scanner yourself? Does your company own the scanner? Are you going to be going out and having somebody else get the scan data for you. So that all that stuff is good to talk

about upfront. Some people may have different ideas of how that should be done. Everybody's got different skill sets and different backgrounds.

So real quick, I'm going to touch on types of scanners. There's a lot more information in the handout detailed about the different types of scanning and types of scanners. There's a wide variety of scanners out there. They're getting more-- they're easier to use. You can see here we're kind of getting that almost touch screen, smartphone kind of layout. So literally within minutes, you can be running through and scanning a project from getting your scanner off the shelf, you can be out scanning a project. It's pretty much that simple.

The scanners are becoming more affordable, so it's more of a likelihood that you could utilize that on your project. It used to be, hey, I don't want to pay \$100,000 for the scanner, no way. But now it's starting to come down, just like any technology, as it's been around awhile it's getting cheaper and easier to make that argument. With that, there's also various processing applications that you can utilize.

The big one that gets talked about a lot and one that we're going to use for this is Recap 360. We're going to use Recap 360 Ultimate for this presentation. But a lot of these concepts kind of apply to other applications as well. But just so you know, that's kind of specifically what we're getting into. There's also various design applications that can receive the information. It's not necessarily just AutoCAD or this or that, or the other thing.

And this is another one of those where it's hard for me to say, this is what you should be using. That really depends on what you're doing, what your project is for, where you're going with it. With this one we're going to talk about InfraWorks 360. We're going to utilize that. OK, so here's the first look, kind of, at the user interface for Recap. Pretty straightforward. As we click through some of these slides, you can start to see similarities to other Autodesk applications.

But the first step is getting the data into your world. And this is where with that class I have an actual issue is, first of all, get the data in your world. Bring it in. Grab it from the disk. Bring it on to your desktop. I recommend bringing it into your computer or your desktop, wherever you want to put it on there is fine, but bring it on your machine first. This data is huge. It can be huge. Even small little stands can be large.

So putting it on the network and trying to work with that over the network before you've cleaned it up can be problematic. Now, in the class that I was referring to, they talked about never do a Save As. Never never do that. You're going to bog down your machine. You're

going to run out of space. And my argument is, you're not going to keep it there forever, right?

You're going to bring it into your computer. You're going to work on it. You're going to get it cleaned up so that it's easier to use, and then you can kick it out to your network and go about it that way. So it's really as simple as doing a Save As, too. At certain increments where it makes sense, bring the data in, bring in the raw scans, save that information somewhere. Make a copy of it so that you can go back to that if something doesn't go right downstream.

And then just like archiving with any other application, where's a good stopping point? Where might I need to go back to and take the other fork in the road? So that's why I recommend Save As. They recommended not, but it is what it is. I think external hard drives are cheap. Computer space is, like again, you're not going to keep it on there forever. Get it off there once you're done, once you've cleaned it up.

From there, so once you start a new project, you're going to get to the import screen, import screen. So it's pretty straightforward. You're just dragging it from an explorer window and dragging it in onto the screen. And that's how you're importing, drag and drop.

AUDIENCE: [INAUDIBLE].

KELLY JOHN
KAEPERNICK: These are FLS files. So we used a FARO scanner. So each one of those folders represents a different scan that we used. So for this bridge project that we used, we used 12 different scans. So we're taking all that-- all those are different point clouds, too. So when you run the scan, each one is going to be its individual point cloud. And basically, what we're trying to do is pull all that information together, unify that information, clean it up, and move it forward.

So just real high level, general, that's what we're trying to do here. So right now, you have individual scans, individual point clouds. They're FLS right now. As soon as I import them in their, Recap, it's going to start converting those into RCS, so the reality capture scan files. Here's kind of what it's going to look like. You're going to get this little sphere for each one of those 12 scans. It's going to start to populate.

Once it gets through the first one, you don't have to wait. You can move on to registering your scans. Once they're imported, again, into the application, registration is going to start taking each one of those individual point clouds. And it's going to start linking them together. And Recap recently has added the ability to do that automatically, but that hasn't always been the issue. I didn't use Recap back when you kind of had to manually register all the scans.

However, once-- well, before I get to that, you see here, where you can skip registration. If anybody can tell me why you would want to skip the registration, I'd be glad to talk to you after class. I mean, I'm sure there's a scenario. I'm not trying to make light of it, but you know, it's in there. Skip registration. Or if you just want to defect they'll go to manual registration. Why you'd want to do that, I'd love to hear about it. But we'll talk about that after class.

Here's where it's going to start the auto registration process. You're going to see the little wheel there. It's going to kind of tell you how it's going, how each scan's going. Once that gets through all of the scans, you're going to get a dialog box like this that comes up. So the automatic registration in this bridge scan that we did, it had 12 scans that we talked about. It made four groups. And there's three scans remaining. So it didn't quite automatically register all of that information.

It needs a little help. So you can go through and you can start picking different-- you're going to see these scans here. The left is kind of the main scan. And over on the right is scan the needs to get tied to that. So if you look at it here, you can see where-- it's hard for you guys to see-- but it's scan number 11. So what I do is I typically go find the one either before or after, because as I'm going around that project, I know that that's going to be the one that has common points that I want to tie together.

So if you've used Recap in the past, you know that basically you're picking here, grabbing these points. You've got red, blue, and yellow, I believe it is. And then you can compare the three points on here and it'll manually register those points together and tie those two point clouds together for you. So it's a little bit more of a process. If you do in a big building or a large site, it may be a little more tedious.

But hopefully, if you do a good job scanning and you do more scans than you think you might need, you won't have to go through this process, hopefully. This one we just happened to because we-- we just did 12 scans and it was kind of a major intersection where we're trying to get underneath. Is that me? Metal plate in my head.

So once you do that, you'll get a screen that looks like this. And here's-- you can see this doesn't look good. Like maybe I didn't do it right. Well, with what we're doing with our bridge project, we weren't overly concerned with the balance. So mostly, we were worried about the overlap and the points less than six millimeters. It's probably hard to see here, but that's like a 98%. So even if it is a red stop color, it still might be a fine scan to move forward. You're going

to have to play around with that on each year projects, or the first few times to understand what is OK for what I'm doing.

It doesn't necessarily need to be full on green all the time. It still can be an OK scan and you can move forward from it. So again, these two here are the ones you kind of want to watch. Mostly this guy here tells you how far apart your points are. And for this project we're looking at it from above, we're trying to see how many lanes we can fit underneath this bike bridge. So we weren't overly concerned about minuscule little points.

AUDIENCE: [INAUDIBLE].

KELLY JOHN You can. Yep.

KAEPERNICK:

AUDIENCE: [INAUDIBLE]

KELLY JOHN Yeah. No, you can use targets, as well. You can do a combination of different things to tell

KAEPERNICK: those clouds how to register once you bring them in. So here's kind of the finished screen. You're seeing the kind of the photo that it took with it. And you're also seeing kind of the overview point cloud there. Once you get to this step, this is where you'd index the files. Indexing it. What indexing is going to do is going to take all those individual scans. It's going to create-- so now they're RCS files.

It's going to create one big RCP project file. And it's still going to reference those RCS files. So if you're going to archive, make sure that you bring all of that information with you wherever you're putting it. Maybe it's just on your desktop for now, but just remember until we get into exporting, it's going to still need that information.

After you've indexed it, you're going to have to kind of basically-- well, and actually said it, I think, on one of these previous ones. Whatever. Basically, sit back and wait. You run it and you sit back and wait while it indexes it. There's nothing to it. Read a book, do whatever you gotta do.

AUDIENCE: Does this take hours?

KELLY JOHN It depends. I mean, it depends on what you're doing. This one here, Paul, do you remember

KAEPERNICK: how long it took to index the scans?

PAUL C To index these scans, there's 12 scans, it was like 35, 40 minutes. I got a pretty beefy

KIRKENDALL: machine now, so it's a lot faster. But even on a slower machine-- we did do another proof of concept of a building where we had 96 scans, and that took like 3 and 1/2 hours. So.

KELLY JOHN Yeah, it really depends. And hopefully you're not just relying-- you're able to go in. I haven't

KAEPERNICK: had any issues with working on other things while I'm doing this. I might not want to go into Revit and work on some large projects or something. But I hadn't seen any performance issues working in--

AUDIENCE: So that can run in the background while [INAUDIBLE]?

KELLY JOHN Yeah, I hadn't seen it. Have you see anything different? No? Yeah. I hadn't had any issues

KAEPERNICK: with it. So again, it depends on what you have and what your office setup-- I don't know what your network setup is like. I don't know what computers you have and those types of things, so--

AUDIENCE: Do you see a clear advantage to using [INAUDIBLE].

KELLY JOHN Not necessarily. We just chose to use that one for this. We used a FARO scanner, but we had

KAEPERNICK: wanted to just kind of work with recap and see exactly how it worked and that type. You had something?

PAUL C We could actually talk about that towards the end, if we could. Because there are some big

KIRKENDALL: differences, we just don't have it in our presentation, just because it's workflow-based more than which the software is better, if that makes sense.

KELLY JOHN Yeah, and that's a good point. I mean, it's all relative. A lot of this is relative, depending on

KAEPERNICK: what you're trying to do. I wouldn't say one is heads and shoulders above the next. But at the same time, depending on what you're trying to do, one might be better. Here's kind of an example of the files that you're going to see. So here, up here you can see my RCP file is what I named AU 215 Fitchburg Bike Bridge.

And down here are all the RCS files, which is in this folder here. So it's supporting my file here. So I have all that information right now. What I did-- why I was seeing this dialog box when I saved is because I actually took out a couple of points and did a few things when I was registering the data and all that. So that's why that pops up and it's asking if I want to permanently delete the points. In this case, I knew I didn't do that much. I'm like, yeah, it's fine. Take them out.

And right there is where you go and you'd say remove points, and then save. So here you can see when, after I went through and I automatically registered and then I also went in and manually finished the registration, you can see here where part of my bridge actually got skewed. So one of my scans, during my manual registration, I didn't pick the right points. Best I can figure is we had three scans up on top of the bridge, and they were below the top. So it was really hard to find different points.

I was trying to go through the screening on there and that type of thing to try to find common points. But really, once I got to this point I realized, you know what, that's not really important to me, the top of the bridge. Again, this is about the roadway below. So what I ended up doing was just turning that scan off. And in the end, I just exported without it. Because it wasn't all that necessary the detail inside that bridge up here wasn't really all that critical to me.

So some of the selection tools that you'll get, they're right down here at the bottom. You get pretty typical window, fence, plane, that type of thing for cleaning it up manually. Now, we're going to talk at the bottom here a little bit about the new features, but if you're having to do manual cleanup, that's where you'd do it. I'm going to speed up a little. Sorry, I'm cutting into Paul's time. Here's kind of a capture, a window capture, of an area. I just did a quick grab of it. You see it turns blue.

From there you can see I have my scan locations are all still here. So you can kind of turn all of those points off individually, or I shouldn't say individually, but per that scan, if you want. You can assign things to different regions. You can assign things to different view states. And all this is doing is giving you a way to look at it differently. So you basically, you're just hiding points. You're kind of almost creating layers like you would in CAD. You're basically just giving yourself the opportunity to clean some of this up, look at it in different ways.

Once you get a few different view states that you want, or the one main one that you want, you can export it out and you don't have to worry about any of that after that. But that's just kind of helping you clean up this data. So maybe I want to turn off the road and I start working through those scans. And I start grabbing just the road and I assign it to that, to a road scan region. That way I can edit that individually from all the rest of the points.

You get a lot of data. There's a lot of points, a lot of information in there. So limit boxes, similar to some of the other applications, Autodesk applications, you just turn on limit box down at the

bottom down here and you get a limit box. And you start cropping it. You can start changing the orientation and those types of things. So you can up and down, side to side, however you need to get to the view that you want. Once you get to that view, you can save it out as a state if you want and go from there. So the new 2.2 features, which just came out this fall, they're adding more automation, kind of like they did with the registration process.

They're adding the features that you can clean up the model automatically. Don't ask me how they do it, some sort of mathematical equation I'm sure. But basically, you can adjust a slider that will say how detailed do you want me to clean this up and how much. So based on those settings, it will start to take out some of these spray points that maybe you don't want. So it's smart enough to kind of know, but it's in beta form so we're still figuring out how good it is.

But they're trying to automate that to make it more of a seamless transition. And lastly, for the recap part, you're able to geolocate using survey data. So your survey data that you'd get from your survey is usually a txt file. You save that file in your normal location. What you do, then, is in Recap you go in and you basically pick this single point mode. You'll place a marker wherever you're wanting. It's kind of hidden behind this guy here, so I kind of blew this up. That's kind of what it's going to look like.

You select this little icon here, is make survey point. You're able to get into this dialog here that calls up this information and you can then make that a survey point. Pick the dropdown here, and you can upload the text file from wherever you have it located. You bring it in. You're going to start picking the points. Once you get three of those points picked, it'll start doing it automatically for you. So it'll start to recognize what you're doing after you do this one and two more. Then you can move on from there.

And then you can check the overall RCMS and the alignment confidence from there. And then from there, you save. So if you want, you can export the information out. Once you export it, it's going to drop all the RCS file information, all those ties, and it's going to get rid of your spheres and all your scan locations and that. Paul's going to talk about what you can do with it after that. One other thing that I want to make sure that I mention, when you're doing the scanning process, when you're trying to figure out how you're going to procure that information if you're working with somebody else or if you're just trying to figure out how you as a company are going to do it, USIBD has a scanning document out there that could kind of help you understand what are the important things. What are the workflows. What is the map process, all that sort of stuff that can help protect you against maybe not getting a very good

quality scan.

So I would recommend starting with that, because even if you're doing it in-house, it's still got a lot of valuable information for you to look at. There's a lot note on that in the handouts as well, so check it out. It'll help you out quite a bit with that.

PAUL C

KIRKENDALL:

Hello, all right, so you got the scan data. And you condense that scan data and take out all kind of garbage on the outside. The 2.2 features are pretty cool, because you can actually take some of the noise out, too, which we didn't use in this project because we did that before that came out. So I'm going to show you some ways to eliminate that noise in Civil 3D a little bit later, too. So to back up on something that I kind of forgot to mention was what we did was a proof of concept.

And the proof of concept was that the city wanted to see what they could do with this intersection, because they had a brand new bike bridge that they built a couple years ago. And they cannot deconstruct and reconstruct this bridge. But they have to do something with the traffic around this intersection. So the concept was, let's do a scan. Let's see how much room we have without having to go out and measure every how many times you have to go out and re-measure it.

And then they want to either add a lane to each direction or a roundabout, just to see how much space do we have. What are we going to do with it. So I put together a video of it, because bringing some of this data into Civil 3D and InfraWorks does take a little while to process. It's not like it takes days, we're talking like 15 minutes per thing that we're going to do. And I didn't want my computer to crash, because it's on the cloud, so hence 360, which means most of this stuff is going to get processed in the cloud. It's going to take a while.

So this is InfraWorks interface. And the first thing that you should do in InfraWorks is if you have the data, go grab the data from GIS. If you don't, they have what's called the model builder. Go ahead and hit. So on the model builder in InfraWorks 360, it's going to allow you to open up a Google-type dialog box. It's going to allow me, also, zoom into a certain area. If I type in an address or just a city, it's going to zoom into that city.

Then I can go in and select an area of my project that I need, up to 200 square kilometers. You have different options up here to select different areas. So you got your rectangle. You've got your polygon. And then you can import one, too, if you had a boundary of a certain area already in AutoCAD or Civil 3D. Type it in for your project name. And then on the bottom here,

it allows you to create a new group.

So you can collaborate with other people that have InfraWorks. You can collaborate with people that you want to put in that group. So if they do have and InfraWorks they can, in real time, work on that model, too. And then it shows you just some data that is going to come with it. So what you're going to get, and this is one that I kind of fast forward, because I've had it take up to 15 minutes to actually send it to me, and create the actual data that's going to pop up here.

So that one I time lapsed. Smaller files are going to take a lot less, so five minutes, it could, up to 15. I haven't really had a go up to 15. But it will send an email. And then it'll also show up as a thumbnail. So then what happens is that it's actually going to the cloud. So from there, I've got to download it to my machine. So the newest version of InfraWorks, I want to say the first 2016 version of InfraWorks 360, had ability to network the model. So you could actually put it on your network, where before, you could only do it on your local machine.

And then once you download it, it's going to open up, and this is what you get. So you see that I get the imagery. I'm going to get the terrain. I'm going to get roads. I'm going to get waterways, buildings. Depending on your area, too, depends on how much information you're going to get.

First thing I do is I set up a proposal for my existing conditions. Usually I'm going to want to mess with the roads a little bit and make them look a little more existing than what Open Source is going to give me. So I'll create kind of a layer like in AutoCAD. I'm going to save this one, go to another one and start doing some work on it. And then I can save a view. Obviously, you've got a big project, it's usually, in my case, miles of area.

So I can zoom in, create a view similar to views in AutoCAD, except I like them a lot better in InfraWorks. And they're called bookmarks. So I'd still call them views for some reason, but it is a bookmark. And then at any time you can come back and that bookmark is saved. So you can come back in and go back to that particular area. And then after that, what I'm going to do is I'm going to change the roads, because this is actually a boulevard. So I want it to look like a boulevard.

I wanted to create an intersection. Now, there are three modules that don't come with InfraWorks. One is the roadways module, then there's the drainage module, and there's the

bridge module. So you need the road module in order to do some of the roadway stuff that I'm going to do here, just so you know. And that is convert to design road. This is InfraWorks 360 with all the modules. So it's the big dog.

And that's what allows me to do the profile. So you can see that when I converted it to a design road, it automatically gave me some new grips for PDIs and PIs. And they look different. So now what I'm going to do is I'm going to go ahead and go to the styles in InfraWorks and drag and drop a style in, so it looks more like my Boulevard that I want to show the city, hey, this is what it looks like now. This is what we're going to do to it.

The other thing is the out of the box styles, obviously, similar to Civil 3D, they don't always replicate exactly what you want. So after I put that on-- and you can see it's easy drag and drop. And then I'll convert the other one to a design road as well. Once I do that, if they connect together like I'm going to get them to, they'll actually create an intersection object, so to speak. And that's what you're seeing here. And in the latest version, they also have the roadway markers showing now.

And the roadway markers are pretty awesome because they actually connect to the traffic analysis that's in here. So depending on where that roadway marker is going in direction, if it's a turn lane or if it's a through lane, that dictates how your traffic analysis is going to run. So an added benefit in the newer stuff. Because the roadway that I have here doesn't have trees going all the way down the center of it, and it doesn't have telephone poles going all the way down the center, I'm going to create a style here that doesn't have the trees and the telephone poles in it.

And it's pretty easy, similar to Civil 3D. Styles aren't as in-depth as 3D. So I'll create one. I'm going to open it up. And in here you have what's called decorations. So in my roadway style here, it shows what it looks like, kind of a cross-section but planned. I can take out the decorations. Say I don't want the trees. They're gone. I'll go in and take out the light poles as well and say I don't want light poles. They're gone.

And then I can also go in here and change width of the lanes. Because right now the default is some funky number. Same with the median. The median that I have here is a lot bigger than what the out of the box style comes with. So I can change that. And you can see in real time, it's going to move over for me. So these are based off of symmetrical properties, which means it's automatically going to do the other side, unless you change some parameters in there and

create one that's non-symmetrical.

From there I can just drag and drop, obviously, to my roadway. And there's my existing conditions. I can bring that to the city and say, look, this is what it looks like. Except, I don't have my point cloud in it yet, which I want to put in and then show what it looks like. I also, again, put in turn lanes. So I add widening for turn lanes. Right now, this road right here, actually has a fully functioning drive-through turn lane. It's not a three lane. It's just a drive-through down the whole entire road.

So I'm going to add a lane to this one side. But I can do widening here, because the winding is a turn lane here. So because it is a design road used with the roadways module, it allows me to do this type of thing, as far as the lanes forward, lanes backward, change my profile, which I'll show you a little bit later. And as far as the intersection goes, it allows me to do the turn lanes and later on, a roundabout.

You also have the option to design your intersection per what type of vehicle has to go through that intersection. So if you had an option for them to say I need this type of semi to go through this intersection, instead of just a little utility truck, I can change that really fast. So I'm going to create another proposal because I want this snapshot to stay kind of the way it is. And then I'm going to create another proposal or option, then bring in my point cloud.

I'm going to create another one, and that is going to be for when I change this to a roundabout, just to see where the area is. And then another one, that's going to be the lane widening. So I have those three options that I can flip back and forth to show the client. Or I can do a drive-through and show him 3D drive-through of each option as well.

It went backwards on me. Now I gotta fast forward it for me. Presented again. Oh yeah. Yep. And then if you hover over it, there you go. You've got to hover over it. I'll try it. Yeah, that's right.

It's not that easy with this thing. They got a mouse on it. Just click on it and drag it.

AUDIENCE: As soon as I do it, it disappears on there. So you've got to do it up there.

PAUL C It's pretty close. OK, so I'm going to try to pause it now because I did some things. I went fast
KIRKENDALL: forward too far. So let's try this again. Where'd my mouse go? All right, stop. And I haven't even had a beer yet. Technical difficulties. All right, give me one second.

AUDIENCE: Feels very sarcastic. Go backwards.

AUDIENCE: I told you we should have brought beer.

PAUL C Right?

KIRKENDALL:

AUDIENCE: I have a question. Can I ask while you're doing that?

PAUL C Sure.

KIRKENDALL:

AUDIENCE: When you were showing us scanning your cloud data, it looked like that was in metric units. It was bringing up meters. And then when you're doing this, like you're laying width and stuff in feet. Is that correct?

PAUL C In here?

KIRKENDALL:

AUDIENCE: Yeah, when you were changing your styles, it looked like your [INAUDIBLE] were feet.

PAUL C Yeah.

KIRKENDALL:

AUDIENCE: Was one in metric units or this is--

PAUL C When you initially get your file from Open Source, it comes in meters. So you've got to change

KIRKENDALL: it to feet, and then it will read feet. Like you see on the bottom-- wrong one. Right here. Yeah, so when it initially comes in, it does come in meters.

AUDIENCE: I mean you were talking about [INAUDIBLE] accuracy or [INAUDIBLE] accuracy. Is that in metric units, then? [INAUDIBLE] metric units.

KELLY JOHN It is, but you can change that as well.

KAEPERNICK:

AUDIENCE: So did you have to change that in before you brought it in?

PAUL C Yeah. And I can elaborate on that a little bit, too, later.

KIRKENDALL:

AUDIENCE: [INAUDIBLE].

PAUL C
KIRKENDALL: Yeah. So what's happening now is I'm bringing in the point cloud, the RCP file, right? And because it was geolocated, I have to assign a coordinate system, the same coordinate system that I would assign in InfraWorks. So I didn't show that part of the video, but before I go to Civil 3D, too, I'm going to have to go into InfraWorks and assign the actual coordinate system to InfraWorks. Because when it first comes in, it comes in latitude longitude.

Obviously, Civil 3D doesn't understand that, so I'm going to have to assign that [INAUDIBLE]. But because it was geolocated with the survey data, you can see that it popped right in where it's supposed to, depending on how good your surveyor is, right? So then, what happened here because when I created the design road, sometimes they automatically bump up or down. I'm not really sure why.

So I'm going to come in here, and this is time lapsed. I did this really fast. But I'm going to bring it down so it's more accurate towards the actual scan, because that's the only thing that was really not as good as when this changed into a designer [INAUDIBLE] it bumped it up off of the actual earth surface, or the surface that came in. So I'm just going in and I'm changing it so that you can see now that that's actually more accurate towards where the points are for that pavement.

And same with intersection. And now you can see more of the point cloud data for the road. So now I can go ahead and create a new proposal. A new proposal is going to give me the ability, so now that I have the point cloud in, I want to actually change the lane widths, not the widths, I want to add a lane going in each direction to see if I have enough room to in between the abutments of this, and to show the city what it's going to look like if I do do that type of design.

AUDIENCE: Is the point cloud now actually in this file?

PAUL C
KIRKENDALL: It's in this file, yeah.

AUDIENCE: So it just barely increased the file size.

PAUL C
KIRKENDALL: Nope. Well, it's a SQLite database. So once it's in, the processing is over. It's not like Civil 3D that every time you turn it, it's going to have to chug it and process it again. It doesn't do that

anymore because it's a SQLite database. So the data is in the database.

AUDIENCE: So if you were in your other software and you changed your point cloud, it's not going to [INAUDIBLE].

PAUL C
KIRKENDALL: Correct, you just re-import it. So what I did now is I changed the lanes. Now I got a three lane and then a four lane. Create another proposal. The last one is going to be for the roundabout option. I need to show the city that a roundabout could fit. I love that part of InfraWorks that they brought in that roundabout tool. Like we can't quite use it in Civil 3D yet, vehicle tracking does roundabouts. But Civil 3D is not very good at it.

Hopefully it'll come forward. Because they're using the FHWA, I think that's how you say it. Standards for roundabouts, so when we get there I'll show that to you. I also sense I'm going to add lanes. You can see that I'm going to change the markers, too. But just like that, that was real time with the roundabout feature. It took that long to change it from a regular intersection to a roundabout option. And it's going to take this long to change it to a different type of roundabout, which to me is fantastic.

I mean, how many times can you actually go in and show a client something like that, with real time scan data? And keep in mind that this scan took me, I want to say, it was 4 and 1/2 hours to scan 12 scans on that bridge. To bring it in to InfraWorks, or recap InfraWorks, and then Civil 3D I've got another day and a half in this. So I got two days in this job that I can go to the city and say, this is what we can do. What do you think?

So I got very little time spent on proposing this job to them.

AUDIENCE: Is this an actual project you're working on?

PAUL C It's a proof of concept. So no, it's not. I'm not sure why that popped.

KIRKENDALL:

AUDIENCE: It went over here.

PAUL C
KIRKENDALL: It's doing some funky stuff. Maybe I hit the mouse again. Oh man. You still get technical difficulties, even though you're not doing it live. Man. It's going again. All right, so now I also have the option in here where I can change the type of roundabout. So they have a bunch of different options for types of roundabouts here, which to me is awesome. And then you see the noise. So now in the 2.2 version, I can get rid of some of that nasty noise so I wouldn't

actually see that. I wouldn't show that to the client.

AUDIENCE: [INAUDIBLE].

PAUL C What's that?

KIRKENDALL:

AUDIENCE: [INAUDIBLE] existing surface over there in that area [INAUDIBLE].

PAUL C You could, for sure.

KIRKENDALL:

AUDIENCE: What has happened?

PAUL C So what I did is I'm open in Civil 3D, but I'm coming back into InfraWorks because I forgot to do what? No, I forgot to set the coordinate system. Because it automatically comes in latitude longitude, which doesn't work. And it's going to tell me that when I'm in it. When I try to bring it into Civil 3D, it's going to say, I don't know that coordinate system. So you're going have to come back here anyways. So that's what I did. The other thing that's really important is you cannot have InfraWorks open when you're going to try to bring it into Civil 3D, because it won't show up. The map won't show up.

It's kind of a pain in the butt and it's hard to figure out why is this not working. So then I'm going to bring in the scan first. Actually, no, sorry, I'm not. I'm going to bring in the InfraWorks model first. And there's the InfraWorks import. Which it's actually going to go into InfraWorks and bring in the data so you can open it. I'm going to look at the SQLite database here, set the coordinate system. And then I select an area.

In 2016, they brought back-- I shouldn't say the Google part because it's Bing now, so they're in cahoots again and I can get live map data. That's what that little thing is, again. So it's going to allow me to go into the area, select my little area, and it's going to bring in all the data from InfraWorks in that area. So alignments, all the profiles are because I did profiles with the two converted roads. And you can see all the alignments profiles that it can bring in. And I can exclude then, too, similar to like an eTransmit, if you know what an eTransmit is. I've got an option to bring in whatever I want as long as it's within that area.

And then this takes a little while, also, depending on your machine, it takes, it chugs, because it's a lot of data coming into Civil 3D. So I did a time lapse on that one and let it go a little

faster. But you're talking like 10 minutes, 15 minutes. If you got really a lot of data, you know, it could take 20, 30 minutes. And that's going to bring it in. It brings in the existing surface, the proposed surface, the transportation surface.

It's also going to bring in, like I said, all the alignments that you selected to bring in. You can see they're real live alignments that I can use in Civil 3D. Now I can hook an assembly up to it and build my corridor. Wouldn't it be sweet if I could have a corridor that would come in, too? Yes, it would. I know. But it doesn't yet.

AUDIENCE: Yeah, that was a much bigger area than you actually needed.

**PAUL C
KIRKENDALL:** It was. I took a lot more than I had to. I'm kind of a data hoarder, a digital data hoarder. I can get, I'm going to take it. So now what I'm going to do is I'm going to bring the point cloud in. So I got too much going on here, so I'm going to turn some of them surfaces to no display, just so I don't see them. I'll turn one back on later so that you can actually see the scan that comes in. The point cloud comes in in here and it's right on the money as far as the surface goes.

So then I'll bring in-- you actually attach the point cloud. So I'm going to go ahead and attach the point cloud. This is super surprising compared to previous versions of the Civil 3D where you brought in a point cloud and your machine pretty much would stop. Well, this is almost a million points after it was cleaned up in rehab, and it's still going to go really fast. And that's real time. That's how fast they came into my Civil 3D drawing.

You can pan around. I mean, you couldn't do this before. But the way that Recap somehow condenses the point cloud, to me it's amazing that it goes this fast. And because of the live map data, I can go ahead and turn that off. Obviously, so I can see, really, where I'm at. Obviously, you have your alignments that are going to be at zero in this case. So I got it in 3D view, it's going to show the alignments down there.

So if I turn the existing surface back on, I'm going to see that thing's going to be right where that scan is. And I'm going to create a surface in here of the point cloud so I have real existing data where I took the scan. And then I can clip out the other stuff, which I don't show how to clip that out. But you can clip out, or paste the surfaces together as a new surface, and have your existing conditions if you start the project.

So you can see how close that thing is.

AUDIENCE: Now, Civil 3D, can it create a surface of a bridge itself?

PAUL C Yes. I did it again. That's three times. Strike out. All this technology and I can't run the easy
KIRKENDALL: stuff.

AUDIENCE: We're going to be doing a PowerPoint class after this.

PAUL C How much time do I got? Oh, five minutes. I'm good.

KIRKENDALL:

[INTERPOSING VOICES]

PAUL C All right, one more try. I'll go through it really fast. Promise. I'll even fast forward a little bit. So
KIRKENDALL: what's going on here is there is I have the ability to create the surface of the point cloud in here. And you also have the ability to change the distance between the points, right? Because this point cloud is over 10 million points. Try to bring 10 million points into Civil 3D two versions ago. What's going to happen?

No way, you're just going to sit there and you're going to see the little wheel going and going and going until tomorrow. So I brought that in because it's attached, which is awesome. I can move it around like crazy. The other part is I can actually change the distance between my points, because I don't need them to be 0.007 apart when I'm creating the Civil 3D surface. So I can change that to be half a foot apart. It's going to condense my point cloud number to I think it's 80,000 points, or something like that.

I missed the play. There we [INAUDIBLE]. So it's going to condense my points to 800 instead of 10 million. Which is going to be a lot better when I'm creating my surface. I'm also going to, on the next one, use non-ground point filtering. I don't know if anybody ever heard of [? Kridging ?] before, but [? Kridging ?] is going to be able to take interpolate in between the points that are non-ground points, so telephone poles, the bridge itself.

So it'll stop at the abutments is what I need. I don't need the bridge. It will take out the noise from the cars driving by. So I'm scanning, a car drives by, it grabs part of that car.

AUDIENCE: [INAUDIBLE].

PAUL C It will take out trees. It'll take out all that stuff. So once that processes, depending on how big
KIRKENDALL: your point cloud is, is going to be how long it's going to process. So I can spread that one up, too. But so now I got [? the ten ?] surface here, that's the point cloud surface that it created.

Now if I look at it in object viewer, you're going to see that all that stuff's going to be gone. My bridge is gone.

All of the noise, the telephone poles, all that stuff is out. The only bad part of this, is because there's a whole lot of trees in there, we just didn't get in there and scan that part just because we didn't need it. But now I have my surface. And in AutoCAD, well, Civil 3D is based on AutoCAD. I can actually go in and create linework, now, off of planes. So I can go from there with that.

So, now that's all folks.

AUDIENCE: Questions?

**PAUL C
KIRKENDALL:** Before question. Thank you. I would personally appreciate anybody that would give feedback on that survey stuff. Every year they do that for us. And I try to get better every year that I come here as a speaker. That's kind of my number one goal. I want to be really good at what I do. Number one, it's technical. The other one, I don't want to be an idiot babbling around trying to speak in front of people. So I appreciate that kind of stuff.

And then they made me put this one up, so that's just that. So now we can do questions.