

LEE MULLIN: OK, well, the doors are closed, so I suppose I should start. Thank you, everyone, for coming to my session. It does mean a lot. I know how busy it gets, and there's so many sessions at the same time. I wanted to go to three other sessions right now, so you should be glad that I'm here as well. Seriously, I've seen this. It's not very good. So my name's Lee Mullin, I'm based in the UK. I joined a small little company you may have heard of called Navisworks, based in Sheffield in the UK, back in 2005. I was the support guy. I was the guy who told you to switch it off and on again, and it all worked again. Yeah? Always the graphics card, or any of the things that kind of went wrong. I was working with those guys.

Obviously, Autodesk came in and bought Navisworks in 2007. Since then, I've had a variety of roles, mostly in the support area. I now work in what we call pre-sales, which basically means that I'm a demo jockey. I'm the person that comes around and shows you what the tools can do. My role is actually much wider now than just Navisworks. I cover the wider construction portfolio which, I think for you guys, if you want to know about advanced Navisworks, is really useful because it's a real hub towards what we do in construction.

So what we've also got today is we've got another co-speaker, a guy called James Austin. James Austin is the current Navisworks product manager. He also looks after some of the BIM 360 tools. He's currently finishing off a session that I left early that I was meant to be running. So he's going to finish that off, come down, and show you some of the cool new stuff that we're working on. So does anyone remember these logos? Has anyone been using Navisworks this long?

AUDIENCE: Yeah, a long time ago.

LEE MULLIN: Yeah, so that was when I was--

AUDIENCE: [INAUDIBLE]

LEE MULLIN: So that was when I was working. Why were you in the Introduction to Navisworks session then?

AUDIENCE: Is this that advanced?

LEE MULLIN: This is advanced. Because This is-- I hope it's advanced.

AUDIENCE: It's not good [INAUDIBLE]

LEE MULLIN: So the reason why we've called this session "Beyond Design" is because we've got a blog called *Beyond Design*. Kind of makes a lot of sense. Who goes on the blog, who uses the blog? Who's never heard of a blog before? OK, so I'd like those guys, those guys who are currently working on the blog-- because we've got a few of them who wanted to come in and say hi.

So we've got Dace at the back. He did a brilliant post recently about AR and VR, and if you went to a construction launchpad, you may have seen him be the guinea pig for the event. We've got Julie Jacobson, who's been helping manage it for the last few years. Go on, Julie, stand up so people know who you are. Julie works within our marketing team on BIN 360 and Navisworks products. And then just up front we've got two of the newest members to the *Beyond Design* family. We've got Lejla and Julien-- if you can both stand up-- who are both based out of Europe, who are going to be contributing more content as we go along.

The look of it's changed, but we've still kind of got the same mission. We want to provide you with useful tips and tricks and interesting content which will help you guys in construction, if you work in construction. If you don't, you'll probably still find it useful and interesting. We're geeks, so we show some cool stuff. We've got James on the blog as well, and I'm just thinking, we've got a full house. We've got Paul Walker, who is one of the original guys who helped out on it. He's currently in other sessions, but he wanted to join.

So the interesting thing about *Beyond Design* is it's quite an interesting blog as far as the Autodesk family goes. We've got lots of blogs that do lots of things, lots of technology, lots of kind of thought leadership. But we were looking at the stats of how popular these blogs are, and it astonished me to find out that we're in third place. We're the third most popular blog within Autodesk. That's quite cool. Well, as far as I know. Julie's going to correct me. Slightly behind, we've got the BIN 360 blog. So I've got a feeling this is the last time I can use this slide.

So ahead of us, we've got the AutoCAD ADM blog. Does everyone read that regularly? No? OK. So that's really good if you're a bit of an AutoCAD developer geek, fine by me. And the most popular blog, which I've got no complaints with because it has lots of Stormtroopers, is the *Between the Lines* blog by Sean Hurley. So, you know, we're quite happy with that for a small construction blog that talks about a bit of technology that started in Sheffield many years

ago. I'm quite happy to be third.

But hopefully, we're going to show you that there's a lot more to Navisworks and the surrounding portfolio to help you do your jobs. No internet connection. So the polls aren't going to work, so I apologize. So what I'm going to do, is I'm going to ask you to raise your hands. Who's based in the US? This is exactly like yesterday. We had a session where I did it all in metric, and lots of people were very upset. So who have we got from outside of Europe? Oh, about four or five hands. Not many. I'm not going to ask too specifically, but it's good to know. Good to know. Here we go.

OK, so the summary of the class, this is what you saw on the class description, this is what made you come, hopefully. The intention of this is we want to show you our advanced workflows. Advanced is a really difficult word, because what's advanced for one person is really basic for someone else. So what my objective is is slightly different. I want every single person in this room to learn one thing. That sounds crazy, but I know there's some advanced people out there, and I know a lot of you use the tools a lot more than I do. So we're going to give you guys a chance to share your information, but I'm also going to try and show you lots of information which might be seen as advanced for one people and not so advanced for others.

What we are going to cover is things like tips and tricks, how to improve productivity, maybe some of the new workflows and links to other products you might not be aware of. It's not going to be a how to guide. We've got too much to cover in 90 minutes. But you can find out more information about everything we're going to put in here, and we've got a really good resource to allow you to learn this kind of stuff as well. We're not going to go into the APIs. Although they are incredibly powerful, and they are definitely worth looking at. We're not going to be a support for them. So I know how these classes work, I've done quite a few of them. And at the end, if you do have questions, feel free to come and ask. But we're not going to be able to answer everyone's questions and talk about what is and isn't working. But there are opportunities to kind of ask for information.

This is James Austin who's just arrived. Who's the product manager, so you can shout at him for anything that does go wrong, and anything that goes right, I'll take that credit. So like I say, what's advanced. So for some people, this is advanced. Right? So who uses these buttons. Who's aware that page up gives you the whole model, page down gives you a selected item?

AUDIENCE: [INAUDIBLE]

LEE MULLIN: Who's-- oh, there we go. That was in the Introduction to Navisworks class, that's how advanced this is. Who's learned something already? There we go, right, this is easy. Right, so this is the agenda we're going to go through. Because I'm basically going to show you lots of cool stuff. I'm going to show you some cool stuff, James is going to show you some of the cool new stuff, I'm going to show you a bit more cool stuff, because James has to get going. And then I'm going to ask you guys to share your experiences and some of your cool stuff, because I know you do it. I know you use the tools in different ways which we don't talk about. And then we're going to finish off with other people's cool stuff. So that's essentially the plug ins and the apps on top of Navisworks that can make it lots more powerful. So hopefully there will be something right at the end where you will learn something, if you've not learned anything at that point already.

Later on, I am going to bring up the microphone, I am going to ask people to share their advanced workflows. Now I've got two rules about the advanced workflows. It's got to be something that you use regularly, and we've got maybe a two minute maximum. So try and keep them brief. But if you can be having a think in your head of, here's something that I think the rest of the group should know about which might help them in everyday work. Now, I remember one of the polls, which is the reason why I was going to ask about this, was what do you do. So can I ask, who works on buildings? Who works on infrastructure? Who works on things like plants and oil and gas? Who works on something completely different that I've not mentioned. What do you work on, sir?

AUDIENCE: Ship building.

LEE MULLIN: Ship building, right, that's fantastic. So yesterday, I was doing the advanced class and I said, what is Navisworks, and showed loads of ways in which it can be used. And one of the ones which I had on there was a ship building. Because I remember my very first week was-- I never even realized you could build ships this big. So that was quite a learning experience. So I'm sure you've possibly got some workflows that some of the other guys don't use.

So I'm going to start off with some cool stuff. And these are all videos, and what I've done is I've shared as many of these videos as possible on a website called Linoit, or "Lin-watt", I'm not quite sure. You've got a link to this in the handout. So rather than me creating a handout with lots and lots of text and lots of how tos, I thought, what's the best way for people to learn.

Normally, it's seeing a video of how it works. So this is an open board. What I'm going to ask you guys as well is if you've got videos you want to share and you think should be on there, you can put this on this board as well. So this might give you a really good way just to be able to access some of these advanced workflows.

So first workflow. We have quickly creating search sets. Who uses search sets? Who doesn't use search sets. Right, those who don't use search sets, use search sets. The most important thing about Navisworks is it drives everything you do. So here's a quick workflow to allow you to easily create search sets. So rather than using the Find Items dialog, in the Selection Tree, you've got the ability to go to Properties. And in the Properties, all of those are pre-made search sets. So if you're looking for Revit families, if you're looking for material names, if you're looking for particular properties, go into the Selection Tree and drill in through the data. And then all you need to do is select that search set, press Control-C, and that will copy the name of that set. And then press the binoculars to create a set, and Control-V, and it will bring it across into that. Has anyone learned anything? A couple. Good, great.

AUDIENCE: [INAUDIBLE] a really big model if your machine locks up?

LEE MULLIN: I hope not. And if it does, that's why we have a product manager. Sorry, James, you're going to get-- this is why James is also running away early. So that's quite a useful tip. Who does timeline or 4D sequencing? OK, so how often have you spent all of your time manually adding each task to each bit? It's a time consuming thing. One of the workflows we recommend is rather than-- in fact, I'm going to go back and start this again, because I think it's worth showing in full. So rather than creating your schedule from your program, why not start your program from the model.

So what you can do is order a load of your search sets. As you can see, here we've got in folders, and we've got the individual search sets and do drag and drop, and create the order of how your building is going to be constructed. And then from there, you've got the ability just to auto add sets-- sorry, auto add tasks for every set that you've got. And this creates an instant schedule. This can then be exported out to Project or Primavera or Asta, and that can be the start of your schedule.

You can then add your resources and the amount of time a task is going to take. And then bring that back in, and then everything's already linked up. You've got the same names of the search sets as you do with the tasks. So it's an easier way to be able to create that initial

schedule, and also a way to link it back in without having to manually move items across. Anyone learn anything? A couple more, OK, good. I'm not going to ask after every one, don't worry.

Who uses quantification? Who wants to-- so one of the things which I would suggest for quantification is, if you're not an estimator or QoS, that's fine. You probably still need access to the quantities, though. So what you can do is set a quantification with no catalog, drag and drop your model into the quantification panel, and it will take off everything in the model. And it's really, really quick. It does it with IFCs in Revit, and DWF files. So you'll see what it's done is you can select any of the walls, any of the items in there, right click them and find that information about the item. And then also the roll ups, and then you can start adding your resources. So this is really good for, say, planners, who can't wait three or four weeks for a full bill of quantities, but need have a rough idea of how much concrete we'll need for a floor or how many bricks we'll need to be able to deliver to site that day.

Now, I think that's quite useful tool for lots of people who spend a lot of time measuring or waiting for things or making guesstimates, you're using the information in the model. Now what I think is really, really cool, and this is another way people use quantification, is for change analysis. So checking what's changed between two versions. So check what changes between these two versions. Did anyone notice changes? Most people know floor changed for landscaping. Most people didn't notice any other changes.

And that's what tends to happen, you tend to get a model come through and you get told big changes that have happened, but not the small ones. So by using change analysis, you can get little indicators to tell you all of the things that have changed in the model between two versions. So even if you're not using it for quantities, you can use it just to see what items have been deleted, what items have changed as far as their lengths and heights.

AUDIENCE: That would be [INAUDIBLE] properties of any given item?

LEE MULLIN: So quantification would tend to come from the properties within the model. So by standard, it's lengths, areas, volumes, those kinds of things. You can add additional mapping to there as well. I don't think it'd work with named properties, but maybe James has got something for you later. Maybe. Maybe. If not, it might be next year. So, who knew you could 2D in Navisworks? Surely there's more people than that. OK, so you can bring 2D into Navisworks. And if you're bringing in things like DWF files, you can bring those in and view to 2D file alongside the 3D

file, and then quickly switch between the different views and find them over items. So here we can see we've got sections, we've got elevations, we've got some of the other stuff within the DWF file.

What we can do is we can select an item and we can find the item in other sheets and other bits of the model. So you can easily switch between 2D and 3D. On the quantification side, this is really useful for verification. If you were going to check that the 3D model has a particular property, and you don't quite trust that property, look at it in 2D. Do the measurement that you would do in 2D that you were going to do from the drawings anyway. So this allows you to quickly, like I say, just move between the different-- the wall on the sections, the wall on the 3D, and other areas as well.

AUDIENCE: [INAUDIBLE]

LEE MULLIN: Sorry?

AUDIENCE: [INAUDIBLE]

LEE MULLIN: So you can do quantification with 2D as well, yes. Yes. So you can do it in 2D, you can do it in 3D, you can do it on PDFs. We recommend that you kind of start with models and then use 2D to catch the other stuff and help with validation, and then PDFs when that's all you get given. But try-- [INAUDIBLE] try to move them. There's another question?

AUDIENCE: Is it possible to add split screen with the 2D of the model [INAUDIBLE]

LEE MULLIN: It might be, but I can't think right now. I don't think it is.

JAMES AUSTIN: [INAUDIBLE] a good outcome.

LEE MULLIN: No. No, I know you can do split views, but I think that's just on 3D. Yeah. OK, time-based clashing. So this is the idea of objects move through space. This could be used for moving plants around, this could be used to kind of verify that some large objects, you're going to be able to move into an area. What you can use is you can use timeline and animator to basically define the path that an object is going to move around, and then essentially clash against that path. So essentially, look for any places where you might have problems within your schedule, within your movement. Now to do this, the only thing you need to be aware of is in the Clash settings, you've got settings linked to Timeliner. So that links to that moving object. And then you just need to make sure you set a suitable number of seconds. So if you've got a one day

program, you don't want it to check for every one second. You want to check it against something suitable.

What this is really useful-- and people use this not only for moving modeled objects, but we also use it for clashing against point clouds. So if you think, any time you've got, maybe, some large chiller units, or escalators, or any large objects you need to move through, you could take a scan of those-- so you could take a scan of the existing area, model of the objects that's coming through, and then do checks against those. And that can be really useful if we start talking about these new technologies like photogrammetry.

So here we've got a really, really bad skyjack which I photographed in about two minutes, so I've not done this properly. But this is a mesh that's come through Remake, so we've used it to create a 3D mesh. And then we're bringing this through into Navisworks, and you can do exactly the same thing. You can do that same kind of check that the path works that you intend to move that object through. So you don't just have to have modelled objects, you don't just have to have point clouds. Think about how you get your data in there.

And if you are using point clouds, have you ever done clashes against them? So it can be-- this is something we're seeing more and more. Did anyone see the announcement with Leica yesterday? Right, I think that's going to be game changing for what we do. Because that's a really handy small scanner you're going to be able to take out into a field, take a quick scan, process it on your iPad, and then get it into Navisworks within a much shorter amount of time. So you can then check that your new MEP service is going to fit into place. You can check that any of your new model data is going to fit in with what you currently have.

So the only changes that you need to make here to clash against the point cloud is you need to make sure you do a clearance clash, because there's nothing to physically intersect. You need to make sure that you-- what was the other thing? So clearance clash, and make sure you have a suitable tolerance. So you're checking to see if any of that real life data comes within your modelled objects. So have a think about what are the tolerances of the laser scan that you've got, and where are the modelled objects, and what do you want it to fit within.

Project folders. This was the one thing I was meant to record a video of last night, but I didn't, because I fell asleep. So I'm very, very sorry. So explain project folders. Are you aware of all the settings that you have for your one individual-- on your one machine, you can share by importing and exporting? OK, a few nods. So you can export your settings and share them

with someone else. Well, that's fine. That works, you know. But if you've got a big project team, it's not ideal saying to everyone, before you start, can you just import this XML file. It's not the easiest thing to do.

So what you can do is you can set up project folders and you can set up site folders on a network drive, and have everyone point their machines at those folders. And that can contain things like settings, work spaces, and some other stuff I don't remember because I didn't record a video to check. So just have a look on the help guide. It's a really useful way of deploying Navisworks to more and more users, particularly if you have certain ways of bringing your data in.

AUDIENCE: [INAUDIBLE] change the file, change the setting, it updates live on everybody's station?

LEE MULLIN: Yes. So if it's on the network drive, I believe it will be the beginning of the next session, that's when they would see it.

JAMES AUSTIN: [INAUDIBLE]

LEE MULLIN: Yes, we can put a video on the-- yeah. So I will-- James just suggested I should put a video on the Linoit. So I've not got away with recording a video. So I will record a video. So James is trying to get me back. Does anyone know how to get to the advanced options? Did you know there were advanced options?

AUDIENCE: Hold Shift.

LEE MULLIN: Hold Shift, perfect, right. That's, unfortunately, your open mic session taken. If you hold down Shift, you can get to a lot more of the options. Now generally we use this for troubleshooting, but have a look because there may be some additional settings which would help you with performance on particular models or using the tools in a particular way. I'm not going to give you any recommended ones because from an official Autodesk point of view, we don't recommend you go into advanced options unless you're troubleshooting. But have a look. I mean, you've probably worked it out quite straightforward.

AUDIENCE: [INAUDIBLE]

LEE MULLIN: So in the options, you would normally get, I think, five breadcrumbs, I think they're called, at the beginning. I think this gives you seven of the breadcrumbs because it allows you to access the registry settings and some of the other settings as well. But have a look in there, if you

might find something useful.

Clash filters. So who uses Clash? Thought so. Most people do use Clash. I've got a couple of Clash videos. This is one where we're using the inclusive and exclusive clash filters to be able to quickly sort through clashes. So this is why I say search sets are essential. If you bring through all your search sets-- in this case, we've got materials-- we can have a look at-- rather than having look at all 88 classes, we can just look at all those ones that are connected to those polyvinyl chloride rigid pipes. So we can more easily kind of sort what we've got, and then maybe group them if they're useful.

So we've also got an exclusive filter as well, where you select multiple items. So as long as both items appear-- sorry, as long as both items are selected, they will appear on this filter. That can be really useful if you want to, again, just really, really refine that wider clash test. I mean, I suppose on clash tests as well, and one thing which I always recommend, you're better having more. You're better having lots of smaller tests than having one huge MEP versus structure. I know we do it. I've done it before with customers. But the thing which I would say is you're better having lots of these small ones, because it makes it a lot easier to report out than to assign to different people.

So I consider that, and are you all aware that you can take your clash tests from one project to the next? Cool. If you weren't aware, go to the Output tab, export your clash tests. Anything where you're using search sets, you can then bring them into the next project. If you're using selection sets, tough. That's your own fault. You should have used search sets. Search sets are kind of the way to move from one project to the next and do it really effectively.

AUDIENCE: Can you use the search sets to [INAUDIBLE] a particular surface instead of a material?

LEE MULLIN: Yeah, exactly. There's lots of ways you can do it, but yes, search sets by those is a good way. A couple of good settings to help you get the numbers down of clashes, so I'll just go back to the start of the video. So are you aware of composite objects? Composite objects that are essentially where if you say a window, a window is made up of the pane, a glass pane, and mullions and lots of other items. Composite object clashing will allow you to say that window is one window. It's not 17 different items. So what you can use is use composite objects to reduce the number of clashes, because you know it's one issue. You can also use the rules to allow you to ignore clashes based on certain sets.

This is really, really powerful. I've seen lots of people using it in different ways. My

recommended way is you use it to look at search sets. Yep, there's a question there.

AUDIENCE: Does this work when you get a final and somebody made a 3D object when the surface just faces together?

LEE MULLIN: I suppose it would depend on the user case, what data's in there, you could create a search set from the file name, I suppose. You can also do things in certain files as well. There's a lot of flexibility there, it just kind of depends on how you're working.

JAMES AUSTIN: I think [INAUDIBLE] composite items, and the answer is generally no, it doesn't.

AUDIENCE: [INAUDIBLE]

LEE MULLIN: There we go.

JAMES AUSTIN: Where if something's kind of blocked [INAUDIBLE] or whatever--

LEE MULLIN: Ah, OK.

JAMES AUSTIN: [INAUDIBLE] it goes in, every time this little itty bitty fire alarm device touches something, I get 40 clashes.

LEE MULLIN: Fair enough, yeah. Good point. , Yeah so maybe you're going to volunteer as well with one of the advanced options later. I'm sure you've got a few. Cool. So what I'd say is if you use rules and you use for composite objects effectively, it can massively reduce the number of clashes you have. In this case, I think we went from-- it was about 2,000 clashes to about 600 or something like that, just by using some of these tools.

Right, sectioning. Sectioning isn't advanced. I really hope it's not advanced. But there are some tools to help you with using sectioning really well. So you can use-- obviously you can use the move gizmos to move it. You can then create a second section plane. And what you can do is you can use those section planes to essentially create a slice of the model that moves all the way through. So if you use this Link Section Planes button, that allows you to just drag that section all the way through. So that can be really good if you're trying to analyze as-built information from point clouds. If you're looking at analyzing certain parts of clashes, it can be a really, really good way just to do the design review based on that.

Now, we've also got another tool here called Fit Selection. So in this case, we've gone to a box, a box section. What we've done is we've used the sets, again, just to select-- I can't

remember what it was, some of the-- maybe ducts or something like this. Where we've selected a number of items, and then we're using Fit Selection to fit the box just to those items. So it can be a good way of just understanding what's in a particular area or just cutting down your larger model.

AUDIENCE: [INAUDIBLE] but dropped down the transform on the sections, you know where your floor height is--

LEE MULLIN: You're going to spoil your chance. Hold on to that one, because that's a really good one. So I would hold on to that, because I think that's a good point.

AUDIENCE: [INAUDIBLE] have this large plant, and you want to isolate it down to a little building, you can plane your section down and you would rename that model as if [INAUDIBLE]

LEE MULLIN: So at no point is it changing what's in that model, it's just a view on that model. But we'll talk about something later that might be interesting.

AUDIENCE: Good.

LEE MULLIN: OK?

AUDIENCE: [INAUDIBLE]

LEE MULLIN: We'll show you something which I think might answer your problems. Who uses BIM 360? OK, I'm going to recommend if you don't use BIM 360, have a look at it. Glue is a really good way of collecting all your models together. So rather than spending all of your time worrying about NWFs and NWDs and NWCs and which ones have been cached and which ones are up to date and which ones are wrong and which ones are out of date, using Glue means you can just open your models straight from a cloud. And it's really effective for a project, because you can then take those same models, create your one for 4D, create one for clash detection, create one for quantification, create one for rendering, and we're all using those same source files. So it's a really, really good way to be able to get access to your data in a much quicker way.

Which leads on really, really nicely to the next piece, which is-- are you aware that AutoCAD has the ability to underlay Navisworks models?

AUDIENCE: [INAUDIBLE]

AUDIENCE: Yep.

LEE MULLIN: So in AutoCAD, we're using a Navisworks model here as an XREF. This has been out for about a year and a half now. So if you're creating a Navisworks model where it's all these aggregated services, all of the AutoCAD vertical products, so your plant 3Ds, your civil 3Ds, your MEPs, you can bring the Navisworks model into that. And it's the same Navisworks engine for viewing, which means it's on a separate process so it improves your performance as well. You can also-- as well as Navisworks, you can also load BIM 360 Glue models into here. So if you've got everybody's uploaded their models into this cloud environment, then people can XREF the live cloud model as part of their design, which is going to help you with doing clash avoidance, which means there should be less clashes that get through to you by the time you do your clash detection at the end of the week.

AUDIENCE: [INAUDIBLE] measured to the desktop [INAUDIBLE]

LEE MULLIN: Yep, you can do snapping in AutoCAD as well. So it's pretty cool. If you just saw there, the navigation was navigation in AutoCAD. You know, how often have you seen that in AutoCAD? So it's really improving the way in which AutoCAD users can improve their design workflows-- by doing it against a live model, or a much more federated recent model, than having 20 or 30 different XREFs that you have to manage individually. So it can really help you out with that.

AUDIENCE: That's like when [INAUDIBLE]

AUDIENCE: What is the [INAUDIBLE]

LEE MULLIN: You cool with that? Are you cool with that? If not, I'll-- yeah, if you don't, I'll announce it afterwards. Yeah. So I've got another poll there. I can't remember what the poll was. So can anyone raise their hands if they haven't learned anything. Right, OK, I'm going to go home. See you later, guys. Right, so that's really good timing. So we've had a few people who were already using BIM 360. Can you raise your hands if it's been 360 Glue? Field? Plan? Layout? OK, no problem. I'm going to pass you on to James. You need to get an updated picture.

JAMES AUSTIN: Do I need to use this mic as well?

LEE MULLIN: You use the mic, yeah.

JAMES AUSTIN: Right, cool, yeah. So Lee asked me to give a brief introduction to some of the other cool stuff, as he calls it. I've been with Autodesk just over four years now. I live in the UK. I also did a

then and now. I used to be an architect, that got me to meet the Queen. Since I joined Autodesk, I got to stick sticky notes to my chest in workshops. I was previously in Autodesk consulting before I moved into the product management role. So, you know, I've worked with a lot of customers in a lot different situations through my time at Autodesk.

So I'm just going to show you a few bits that are pretty interesting. I think you guys might like, especially if you're in the advanced stage. I'm kind of showing you something a bit naughty here. You haven't put my automatic plays in, Lee.

LEE MULLIN: Don't worry, I can play them.

JAMES AUSTIN: Bloody hell, man.

LEE MULLIN: I'll play them.

JAMES AUSTIN: Do nothing. Right, so first question we got asked when we released the AutoCAD underlay was when's Revit coming. You just did exactly the same thing, which is really cool. This year the Revit team are going out announce at OU that they're going to be bringing this out in the next version of Revit. So we've been working with them in the last 12 months to support their implementation of this. It's part of the new drawing API which allows any object to be drawn into Revit.

The first example is using the Navisworks core engine. So you're getting Navisworks performance native to Revit to suit a lot of workflows. They've got a demonstration showing a 2 gig InfraWorks model. I am a bit more construction focused, so you know, the kind of applications you can get here by bringing in a coordinated services and structure model into your architectural designs. Then when you're making your changes to that, they can be done in context.

So as you see here, pretty standard sort of workflows. You're working out in your corridor layouts, you got a new fire door requirement, you can bash that wall in in Revit pretty quickly. It's a pretty powerful tool, for those of you that don't use it. I'm guessing most of you probably do. But we can use those tools to do that. Now that we've got the context, we know that live information from the Navisworks model, that's the coordinated team, we can actually start to design around that and kind of make the clash detection in Navisworks redundant. Which is really the ultimate goal around having crash avoidance, so we don't waste time finding, managing, communicating, and editing. You can actually do that on the fly. So I think this is

pretty cool. This is exciting stuff to be talking about at OU this year.

AUDIENCE: How do you get in?

JAMES AUSTIN: It's kind of-- they've used the same interface as like, an XREF-- I can't remember what it's called in Revit-- where you can manage links. So it's kind of the same sort of functionality. Yeah, sure.

AUDIENCE: Would you say that [INAUDIBLE]

JAMES AUSTIN: No, I didn't say that, because you can't right now. We're working very closely with the Revit team to help them with their roadmap of what functionality needs to come next. Is it accessing the object properties, is it being able to snap and measure, that kind of stuff. You know, I'm kind of showing a bit more than I probably ought to at the moment. So don't go telling, don't go tweeting this, that would help me.

This one's pretty cool, and-- you'll need to press play again. I can talk about this. This is out in product, but you may not be aware of it. The ReCap team released a 3.1 update very recently, a month or two ago, I think. In that, they took the same technology again, so they've implemented the Navisworks core engine into ReCap. So what you're seeing here is a bit of workflow around positioning the point cloud. So they've gone into this industrial facility, they've done a scan of some existing equipment, some pumps and pipes and stuff that looks cool in ReCap. They then position it.

But then going back into ReCap, what you can do now is jump into the real view, I think it's called, where this is the photo data with the point cloud underneath. You can measure it and stuff, but it's very high fidelity. From that view, now, you can link in Navisworks model datasets. What you get then is this fantastic blended reality environment where you've got the reality capture data-- you know, the real stuff-- and then you've got the CAD data overlaid into that space as well.

AUDIENCE: So you're showing this on the smaller scale. How does that whole system work with civil, because I know they've had a lot of issues with the 6 million, 2 million, [INAUDIBLE]

JAMES AUSTIN: So what I can speak to is the technology they're using to bring that CAD data in is Navisworks. Navisworks handles huge data sets really well, that's one of the reasons why you're all sat in this room learning more about it, I would suspect. So that's not going to affect the performance, because that's running Navisworks. We're using all the clever stuff that we do

around occlusion and depth and so on to make that performance. I can't speak to how the performance of a massive data set in the ReCap side of things, you know, the huge scanned data sets. This isn't going to change that. But this isn't going to have a massive effect on it, either, because--

AUDIENCE: Well, like, the Revit guys don't want that out there, right? They don't want that, you know, coordinate system, they want the local system, so like how does it--

JAMES AUSTIN: So that was-- the little bit at the front was just basically getting things in the right place. That's kind of a workflow that's very easily done in Navisworks. Take the point cloud, put it in the right spot. Then when you bring that Navisworks model back in, it's in the right spot. So I'm sure there's some work to be done there. But I thought you'd be interested to see that, it's a brand new feature and a brand new functionality.

AUDIENCE: [INAUDIBLE]

JAMES AUSTIN: Sorry?

AUDIENCE: Do you have to have [INAUDIBLE]

JAMES AUSTIN: It's the ReCap 360, so it is a subscription service, I believe. So, yeah.

AUDIENCE: But you would need to follow the version [INAUDIBLE]

LEE MULLIN: I think it's in Pro. One thing I'd suggest is if you haven't yet looked at Collections, have a look at that. Because that not only gives you Navisworks Manage, but it also gives you ReCap Pro. So it might be worth looking at.

JAMES AUSTIN: And then kind of one of the things that-- this is kind of just showing some of the--

LEE MULLIN: I need to play?

JAMES AUSTIN: Yeah, you need to play again. One of the things that we are doing is trying to take a lot of the workflows that we've developed and strengthened in Navisworks and take those into the cloud. So what you're seeing here is some work that we've been doing on top of BIM 360 Docs to create a clash engine. So one of the next things to come, I guess, is how we attach this to data that lives in BIM 360 Docs. And really, this is kind of changing the whole process and approach to clash. We're quite excited about this.

At the moment, clash in Navisworks is creating lots of search sets so you can do them quickly, thanks to Lee now. But then it's about having the sense to match those up, create clash pairs, run the clashes, perform some analysis and groupings, and make that efficient to get to the bits that matter. We're taking this to the cloud now and automating all of that. So when you upload your models to BIM 360 Docs, the clash engine is run automatically in the cloud. We've got some logic applied to that to group them, and then we can present those back. And this is all done in the browser with zero client install.

So that entire workflow, the whole process of setting up clashes, getting everyone's models, running the clash report, condensing that down, turning it into something that you can have a meeting about, then discussing it, is starting to change with how we're starting to approach this in the cloud. And we're looking at-- there's a lot of stuff in there. So I kind of echo Lee's statement about, if you've not looked at BIM 360, now is probably a good time to start doing it. Because we're really starting to transform workflows up there with some of this technology.

And I think the cool thing is this is kind of all underpinned by Navisworks. You know, this is the same clash engine as in Navisworks. We've had a lot people ask us about over the years, you know, when are you going to sync your clash data. This kind of really starts to open that up.

LEE MULLIN:

Can I, before you go into that one, I think one thing that's worth mentioning, and look who I get to sit next to in product team when I am very rarely at home in Sheffield, and I think what these guys are doing at the moment is we're trying to make-- if you want to do clash detection and you want to do clash detection well, you have to be an expert. You have to know the software pretty well. Would you say that's fair? Yeah?

What we want to do is we want to make this kind of clash process easier and more common sense, which means that you guys don't spend all of your time messing around with reports and viewpoints and sending them off to people. You guys do the high value stuff, you guys do the escalations and this stuff which, really, is what you get paid to do. You don't really get paid to spend all of your time messing around with viewpoints and marking them up. As much as you may enjoy it. So I think the work that these guys doing, when you start seeing that surface in the product, I think you'll find that it will free you to do some of this other cool stuff that you want to do.

JAMES AUSTIN:

And just kind of last discussion point about that, this is a demo of, really, what's capable with the new Forge Viewer component. So this is an example dataset showing a Revit model that's

been uploaded. What we can actually start to do, now that we've got all the stuff in the cloud, is when you've got intelligent data, such as a Revit model, where there are associations made between it, we can start to do some really cool stuff. So in here, you're seeing me select elements in the 3D model. These are actually being highlighted in the 2D as well. We can do the same, we can pick stuff in the 2D and isolate that in the 3D. And because all of that information is linked at the data layer, on the property side of things, as well, we can also start to look at it differently.

So on the right hand panel, you can see here we've got a view of the model from a data centric point of view. So here we're pivoting onto the object type from the Revit model. We can then click on things-- so pipes, in this instance. And we can be highlighting that information in both the 3D and also the 2D sheets down here. So the more intelligent your data, the more intelligent stuff we can do with it. And this is our move towards Forge and our doubling down on that common platform is really enabling us to do some pretty cool workflows. We can also do things like show me every sheet that that wall is on, as well as highlighting it in the model. We can start to do this. There's some really big opportunities with our cloud technology, now that we're starting to standardize on that.

And I think that-- oh, yes, this was a little bit of research that we did a while ago. There's the other one not playing. Starting to look at breaking down models as well. So we're starting to now do some research around creating work break down structures, so actually chopping models up into pieces. So in this instance, you're seeing here, we're auto generating a location breakdown structure. So we've got floor, levels, and zones. And what we're also doing is some research around, can we actually start to only load different bits of a model.

So what we're starting to see is this idea of kind of a Navisworks in the cloud type solution, where you put all your information in the cloud and then you create your one aggregate that everyone has access to. And depending on what you're interested in, you can just load different bits of it. So if you're wanting to create a quantification schedule of all the concrete slabs, you just want to pull that information down. And we can start to do that. So we're really start to tear apart the boundaries of files and start to think of things in terms of object level data. And then the smarts, they're up there, too. And that, I think, clears me to go and talk to customers about this.

LEE MULLIN: Yeah, cool. Thank you. Did anyone think that was interesting?

AUDIENCE: Yeah.

LEE MULLIN: Is anyone looking forward to seeing what happens with BIN 360? That's a good sign. There was a few doubts, I hope not, by the end of it.

JAMES AUSTIN: I get a lot of feedback on this, you know, what does that mean for Navisworks. I hope what you're seeing, what I hope I've got across, this technology is underpinning all of our [INAUDIBLE] as well. It's the same engines that you're familiar with, it's got the same power. What we're trying to do is expose that on a platform that is available through a browser. You know, not having to install that. And, you know, Navisworks is 20 years old, 15 years old now.

LEE MULLIN: 15.

JAMES AUSTIN: The UI looks about the same age at the moment. It's pretty complex, it's pretty gnarly. You know, a lot of people are very fond of that. I love it, so, you know. But that whole demand for simple access to the information on the BIM project is really what we're trying respond, to make it available to everyone.

AUDIENCE: Yeah, I want to ask about [INAUDIBLE] records. We had an image [INAUDIBLE]

LEE MULLIN: So I'm going to stop you, because I don't want this to be a support forum. But we do cover something later which you might find interesting. So if it's still there at the end, feel free to come and have a chat to me. But, yeah. We'll move on. And I want to make sure James gets away. He's a busy man, he's a product manager. So if you see any of the other product managers around, buy them a drink. They'll need a drink by the end of the day.

JAMES AUSTIN: And I will talk to anyone. If you see me in the halls and want to ask a question, always available for a chat.

LEE MULLIN: And he's also on Twitter. If you see on the bottom. So we've got leeroyb-- I mean, I'm leeroyb. And you're-- yeah. And then virtuararch.

JAMES AUSTIN: [INAUDIBLE]

LEE MULLIN: Yeah, exactly.

JAMES AUSTIN: Thanks everyone. [INAUDIBLE]

LEE MULLIN: Thank you.

[APPLAUSE]

So in my opinion, he gets to show the really cool stuff, and I get the eh, cool stuff. So I'm fine with that. So right, here's number one, DataTools. Who knows about linking databases to Navisworks? Who knew you could link a database to Navisworks? There we go. We've got a few that knew we could. So you can link to a database, basically anything with an ODBC driver, you can connect to. So you can connect to things like Excel.

So if you've got a list of all your information that you want to link into your model, you can do that. The big thing I'll always say is make sure you know your SQL, because then you'll be able to navigate to the right bit of a database and link things to the right place. But it means that you can then, as you can see down here, we've got some of the information that's been pulled in through DataTools that comes from, essentially, a spreadsheet or SQL database. Yep, question there.

AUDIENCE: So I've had some really [INAUDIBLE] issue to get this working. Has anybody else had that happen? Does anybody else use it?

LEE MULLIN: I would suggest-- and we'll talk about this later-- the forums are a really, really good place to help you with that I'm going to admit whenever I got a support question about DataTools, I hid. I gave it to one of our developers, because I'm not an SQL expert. But, yeah.

AUDIENCE: It's a really powerful tool because it can really help you do a lot of things.

LEE MULLIN: Fantastic, yeah. But I think, yeah. If you look at the forums, it's a really good place. And there's a lot of people who are very willing to share past experiences and information about how you can access that information. So have a look.

AUDIENCE: Then 360 Glue and Field and Equipment Mapping, you're going to want to do it by search sets in the first place. You'll be able to push data. [INAUDIBLE] without having to go through some of the web-based fields stuff would be real nice.

LEE MULLIN: Yeah, yeah, yeah. I mean, we'll talk a bit about that link later. Because I think there's only a few people who are working on that at the moment, but we'll talk about that. The Batch Utility. So for those guys who aren't going cloud based, those guys who are very much file format based, there's a tool called the Batch Utility. So you need to open Navisworks as an administrator, and you can use the Batch Utility for a whole bunch of things. So unfortunately

my screen was a bit small, that's why I was moving the windows. But you can use this to convert a whole bunch of files overnight, every night.

So if you need to convert some large, say, plant files, and you know each one of those takes half an hour to open, then you can use the Batch Utility to do this on a machine overnight, and then the NWCs are ready for you in the morning. So this is a really useful tool. So there's lots of stuff in here. It can also help you create lists of all the files within your NWF file. You can automatically create NWDs, maybe on a Friday night at 7:00 PM after everyone's gone home, hopefully. So you can use it for lots of different ways to be able to automate some of your work flows.

I'll just show you the whole thing. So basically, what this does is this creates a little batch file. I think it's a TXT file. Just save that somewhere on your machine or network drive. And then it allows you to go into the Task Scheduler. And then you just say, do we want to do this on a daily, or weekly, or monthly basis. So it can be just a way just to automate some processes.

Workspaces. Now, for anybody who-- was anybody in the Introduction to Navisworks session yesterday? So we have a few people who really, really want to be experts very quickly. So that's good. We talked about this yesterday. Are you aware, you know, workspaces, you know how to move windows around. You know you can save workspaces for different purposes. So what we can then do is we can say, set up a workspace which might be a quantification workspace, but then we can just quickly flick to a Clash Detection workspace, or a Timeliner workspace, or one to allow you to do appearance profiles. So you can save--

AUDIENCE: One less monitor.

LEE MULLIN: Sorry?

AUDIENCE: Reconfigure that same [INAUDIBLE] for one less monitor.

LEE MULLIN: Exactly, yeah. So here you can see we're moving through a few different ones. So we've got things like quantification and minimal setups. So I find the minimal setups really, really good for beginner users. Where you want to force them to do a particular process, and you don't want to scare them. You can share that workspace and you can say, navigate a model, do some measurements, have fun. And then we'll come back in a week and we'll add some more tools. And it can be a good way to help with the training.

IF rules in quantification. So there wasn't many people using quantification, but if you are, you

can set up resources which do, for example, look at add waste figures to an object or to a resource. You can also do things like IF statements. So this could be, in this case, we want to look at all the walls. And any of walls that are over, I think, eight meters, we need to build a scaffold in place. So we're just saying if the model high is over eight meters, then we'll add a count of one. If it's less than that, then we'll add a count of zero.

So it can be used as a really quick way to maybe identify key elements. There's lots of ways that can be used. That's a really simple one, but you can then start maybe saying if a model area is over this size, then we have this waste. If it's under this size, we have this waste. So you can use it in a really, really powerful way. So here you can see we've got 264 walls, and we've got 38 of those which will need scaffolds. So that's quite a powerful tool as well.

AUDIENCE: Those IF statements, are they only generally spatial, or can you look at properties or--

LEE MULLIN: So what you'll be doing with an IF statement is you'll be taking a figure, you'll be taking the number from one of the other quantifications, and then you'd be doing something based on that. So a height, or a length, or an area, or a perimeter. It can help you with those kinds of things.

So for those guys who are using BIM 360, you might be using BIM 360 Field to collect commissioning information, or you might be using it to start collecting progress information against model objects. So what you can do is you can use the Equipment Properties tool, which is currently in the app store, if you go into the Navisworks app store, and that allows you to essentially pull down any of the properties associated with the model that have been collected out on the iPad.

So we can then select any of these panels, and you should see, once we've selected it-- I selected the wrong thing in my video and didn't re-record it. We should then have a BIM 360 Tool tab, and on that BIM 360 tab we can then see serial numbers, installation dates, warranty information, progress information. We can see all that stuff and then start doing stuff with it. So things like appearance profiles, for those who like to change up colors, it's a really useful way of viewing that data that's collected out in the field. And I'll tell you some of the ways you might use that in a minute.

Is anyone aware of Properties+ as an extra tool? Was there a hand there? So this has recently been updated by one of our developers in Sheffield. And what Properties+ allows you to do is--

you're probably aware, you've got lots of tabs whenever you select anything. It can be a nightmare to find three or four different properties about one item in one place. Properties+ is essentially a toolbar that allows you to collect a number of properties from different tabs in one place. So think of it kind of like Quick Properties on acid.

So what you can do is you can then say, we want to see some of these BIM 360 properties, we want to see some of the Element properties, we want to see IFC properties, if they're available. We bring them across, we can change the colors of those properties as well. So we can highlight that a serial number comes out in red so we can easily see it. And then we can export and import this list into new projects, as well. So you'll see this, pretty straightforward when we press OK. We're just going to change for color of those, so we can see we've got a couple of those that are going to be red. But this is a really useful tool to kind of get rid of a Properties toolbar. Because I'll admit, Properties toolbar is not the best way to view properties. This is a really useful way to be able to identify it in one place.

Now, for me, the biggest thing I shouted about was we need hyperlinks on those properties. So Properties+ allows you to take those hyperlinks and be able click out of Navisworks very easily. So hopefully that one's a big useful one, particularly if you're using Field. Because you can then link to photos, link to manuals, link to any of those things, bring that information in, and have it all in one place. Yep, question at the back?

AUDIENCE: [INAUDIBLE] URL properties only available in '17?

LEE MULLIN: It's only available in new version of Properties+ which, I believe, it goes back to the 2016 version as well. I think it updated the 2016 one on the 2017, but I'm not 100%. But feel free to get in touch with me on Twitter, or I've got contact details on the handouts.

AUDIENCE: The other nice thing about this is that you can create selection sets really quickly.

LEE MULLIN: You can. You can.

AUDIENCE: It's really nice.

LEE MULLIN: But I'm going to show you some other ways as well, which might be interesting.

AUDIENCE: [INAUDIBLE]

LEE MULLIN: Sorry?

AUDIENCE: [INAUDIBLE]

LEE MULLIN: So Properties+, completely free. He's working on some more at the moment, which I wasn't allowed to show you. We can show you the really cool stuff that's coming in six months, but we can't show you the cool stuff that's coming in one or two months. But yeah, I'll promise you there's some cool little apps that we're looking to put on the app store.

Selection Inspector. This is a really good way to visualize data for a number of items at once, or even just export the data all in one go. So the Selection Inspector is just a little button just on the Home toolbar. And what you can do is you can select a number of items, use Quick Properties to say which properties do we want to see. And then just select a bunch of items. If a property's there, you can see it. If it's not, it's not. Use the Quick Properties to basically say, I want to see some BIM 360 properties, or I want to see lengths and areas, or I want to see materials. So again, it's kind of like that Properties+ in the fact that you filter down what you want to say.

The nice thing about Selection Inspector is it allows you to get it all out into Excel and then start manipulating the data there. So this video is a little bit longer than I wanted. So I'm going to just skip to after that. And you can see, we've just got warranties, warranty start and end dates. And when we Scroll down, we see any-- we can basically find the gaps, essentially. So we'll be able to find the gaps of those ones which haven't yet been selected. So again, just a quick way of being able to access for data.

Progress Tracking. So a tiny little bit of *Star Wars*, for anyone who's seen any of my *Star Wars* classes. So this is using the same BIM 360 Field properties to start collecting progress information. So anything that's been tagged with some progress-- so this is progress that you state. So it could be the standard out of the box statuses such as delivered, ordered, installed. Or it could be your own kinds of progress information. In this case, moved to cargo bay, tested by Chewie, installed using a womp rat gun. But it doesn't really matter, it's just statuses that help you know what stage are you at. You can link that back to the model, and then once you've linked that back to the model, you can then start using the appearance profile to color it up so you can see whereabouts you are.

Now, we've done some really cool stuff recently with BIM 360 to allow you to share this viewpoint, keep the overrides, and then share that back on the iPad. So if you've got progress information, you could use a BIM 360 shared view, which will then propagate into the iPad

app. So you can then open it on the iPad and see what the difference is between yesterday, today, tomorrow, and see whereabouts you were up to. So this can be quite a powerful thing to do as well. And then when you start linking that into Timeliner, you can do some quite interesting stuff to say where are you compared to where you should be.

COBie. Right, so I'm going to pause on COBie because I know it's not quite the same here as it is in the UK. Is anyone using COBie? Does anyone have-- does anyone know what COBie is? OK, so there's probably a few. So to explain COBie, in the UK, it's being mandated as a way to archive the data from a project. So basically, it separates the geometry from the properties. You're handing over a database with all the properties in the model.

So what we've done for the UK market-- and we think it's going to be more widely used in Europe-- is created a tool to allow you to export all this data to a standardized COBie spreadsheet. So in this case, we've got an IFC file that's come from ARCHICAD, and we've got this COBie tool that basically allows you to map one property into a standardized spreadsheet. Now, this is used mostly for COBie, but if you're working on anything where you've got a specific deliverable you've got to hand over in a specific way, you can set up mapping to say, every time I have a serial number, I need it going to this field into any kind of spreadsheet.

So this could be used really, really widely for different purposes. COBie's the main purpose right now. But essentially, this allows you to map all of that data that's in there into, essentially, this kind of standardized spreadsheet. What you can then do is you can then select items. So COBie uses kind of this concept of spaces. So anything where you've got, for example, all the toilet information is associated with a space. You know, all of the gym stuff is associated with a space. So you can then kind of go down to certain selections as well. So might not necessarily be used day to day, but it's worth being aware of. It might help you out. And it allows you to export that out to SQL or Excel. So again, just another way of accessing your data.

AUDIENCE: So could you then push that back into the Revit model so that you have different elements that were tagged [INAUDIBLE]

LEE MULLIN: So we have COBie tools also in Revit, as well. So that's one which is a bit of a longer conversation as to how you would do that.

AUDIENCE: Maybe Dynamo [INAUDIBLE]

LEE MULLIN: Well, what we'd normally say is you're doing all the COBie stuff in Revit, and then you bring it

into Navisworks to get additional data from DWGs or IFCs or any of the rest of a project. But it's an interesting one and, you know, come and have a chat to me at the end. Something I've done quite a lot of recently, talking about handing over deliverables.

AUDIENCE: [INAUDIBLE] back into Revit. About half of the equipment properties in the BIM 360 field are COBie compliant. Maybe more [INAUDIBLE] will be COBie compliant.

LEE MULLIN: Yes.

AUDIENCE: I'm not familiar with it, but I know there's a way to bring that back into Revit from--

LEE MULLIN: Yeah, so you can take those BIM 360 Field properties that we showed earlier, coming into Navisworks, you can bring those into Revit as well. So you can bring in your serial numbers, installation dates, into Revit. They'll normally go into a BIM 360 property in Revit, but you can use Dynamo to map them back across. But that's for the Revit class, so maybe next year.

The next one I want to talk about is Layout. So this is another tool. So I'm going to start talking about some of the additional tools that might help you out. So who has to take any of their buildings or civil and actually start laying them out on site? I'd imagine most of you, somehow. What Layout allows you to do is create points that can be taken into total stations. And you can either do this as text files or CSV files, or you can take them to BIM 360 iPad app. But essentially, allows you to automate the creation of all these points, rather than what we see on a lot of sites where people have a big drawing and then rulers and tape measures, and then working out where they need to lay stuff out. So this can automate that process really easily.

So here what we're doing is we've added a point to every single one of the piles in the project. And we did that within a few seconds. So this video-- don't worry, this video is on the Linoit video as well. But it's a really, really useful tool if you want to make sure that people are laying out against where objects are modelled rather than making assumptions based on drawings. You can use these same points to check as-built information as well.

AUDIENCE: [INAUDIBLE]

LEE MULLIN: Sorry?

AUDIENCE: Is that something that [INAUDIBLE]

LEE MULLIN: You're not allowed to say the t-word. So yeah, those points, because we're in CSV or TXT

files, you can put them into any total station. We don't care. When it comes to BIM--

AUDIENCE: [INAUDIBLE]

LEE MULLIN: Sorry?

AUDIENCE: I said, I don't get to [INAUDIBLE]

LEE MULLIN: Yes, no, it's absolutely fine. So you can push back data to [INAUDIBLE] those files, you can push out the DXFs and DWFs from certain tools as well. But yeah.

AUDIENCE: But after you get them a long ways away from 0, 0, I've learned that your navigation gets really bad. We got a project where we placed the model so it's in the real world, and our navigation [INAUDIBLE] crazy. It's kind of hard [INAUDIBLE].

LEE MULLIN: Navigation where, in Navisworks?

AUDIENCE: Navisworks.

LEE MULLIN: I'm not sure of that one, but--

AUDIENCE: [INAUDIBLE] then you don't have to worry about running on the same [INAUDIBLE]

LEE MULLIN: Yeah, I mean, I'll be honest. I've never seen that for, what, since I did support back in the Navisworks limited days. I'm not saying it's not happening, but I'm saying I'm not seeing it.

AUDIENCE: [INAUDIBLE] MEP contractors.

LEE MULLIN: Yeah, no problem. What I'm going to do is I'm going to move on, just in the purposes of time. So I've got 25 minutes and I want to give some time back to you guys to share some points.

AUDIENCE: Are those APL points?

LEE MULLIN: APL points, yeah. So get the point you might have known it as, but it's part of point layout, so you can have that plug-in in Navisworks, Revit, and AutoCAD. This is a really big one for me. This is one which I've done a lot with recently where-- is anyone using Infraworks? Infraworks allows you to create a model really, really quickly. In 15 minutes you can say, give me everything you know about this area of up to 200 square kilometers. So you can get lots of the surrounding data. So this can be-- this is Bing maps, this is any of the data that's available for your area. So it will bring in buildings, roads, waterways, a whole bunch of stuff. We can then

export that data out to FBX and bring that data into Navisworks.

Now, why is that useful. If you think about things like Timeliner, how many times have you kind of spent a lot of money on creating a data set that you can use as citywide context. Now you can do it in 25, 30 minutes using tools that you already have in your collections. So you can see performance is really good, it brings across all the images as well. And I'll talk about one of the other ways you can use that data in a second, not yet. The measure tools, the measure tools. Are you aware that you can use shortcuts and you can use these lock items to be able to measure according to the x, y, and z-axes? So we've got those, so it allows you just to be able to make sure that when you use certain-- I can't remember, I think it's just Control+X, Y, and Z, allows you then to lock to certain axes.

AUDIENCE: You don't even need to control them.

LEE MULLIN: Sorry?

AUDIENCE: If you start the [INAUDIBLE] command, you can just hit X, Y, Z.

LEE MULLIN: Yes. Yeah, exactly. One of the other things that you can do as well is you can press Enter and that will allow you to zoom into that area so you can make sure that you snap into the right place.

AUDIENCE: Is it [INAUDIBLE] make sure you're using project internal coordinated from Revit, otherwise your buildings-- if it's a few degrees turned in the real world off of north, using the x-coordinate's useless.

LEE MULLIN: Yeah. Yeah, yeah, exactly. But you know, I think that's those things that you learn as you do projects, as well. So this is a really good one as well. So this is one where if you bring in something that's out of place but you know you don't have to worry too much about getting all the coordinates correct, you just want to move it to the right place, you can use the measure tools to allow you to essentially move objects.

So if you know, for example, you've got certain data points within your models and within your drawings, you can use them to basically just say, I want to move this from here to there. Select the object, use the measure, transform selected items, and it will put it in the right place for you. And then you can just do your rotations as you need to. So it can just be a quick way to get things in the right place, particularly if you're doing things like site layouts, it allows you to pull stuff up. I'm just going to stop questions for a second, just because I'm wary about time. I

want to make sure I get everything through.

Now, this is something that we put on the blog last week, I think. Are you aware you can do cloud rendering from Navisworks. And as part of the cloud rendering, you can create these pretty impressive, I'd say, panoramas. So this is InfraWorks data brought into Navisworks alongside the model data that we've got anyway, and we can then use it to, in this case, start investigating things like crane visibility from a crane cabin, so make sure that everything's going to work. This can also be used for lots of things like tenders and helping wind people, you know, wind beds. When you do your panorama, you can also do stereo panoramas. So you can basically put your phone into one of these Google Cardboards, which cost about \$5 or \$10, and then use it just to pretend that you're in a 3D virtual space. So again, it's quite useful, and allows you to use that federated model for another purpose.

AUDIENCE: What was that [INAUDIBLE]

LEE MULLIN: So the model was from Infracore brought into Navisworks. And then you use a thing called A360 ren-- sorry, you use cloud rendering within Navisworks. So you'll see in the last couple of versions, you've got cloud rendering from there, go to a particular point, send it up into the cloud, and then you just change your settings based on what size you want or what quality you want. So, your turn. So what I've got is I've got this microphone. Does anyone have any advanced pieces which they want to cover, which I haven't covered? Because I'm sure there are.

AUDIENCE: I have one [INAUDIBLE] yeah.

LEE MULLIN: Awesome, cool. Bring the microphone just to make sure everyone can hear you.

AUDIENCE: One thing that, I don't know if anybody really utilizes, but the Quick Access toolbar. Instead of having to jump through lots of places on the ribbon, you can just right click on any command and say Add to Quick Access toolbar, then you can collapse the ribbon and you can even put the Quick Access toolbar below where the ribbon was, and you get another two inches or so of screen space.

LEE MULLIN: Yeah, that's a really good one. That's what I should use, and that's definitely under two minutes.

AUDIENCE: The way you arrange that ribbon stays in the workspace.

LEE MULLIN: Yes.

AUDIENCE: So you can arrange--

LEE MULLIN: So you can save the workspace and you can get-- again, it's really good if you've got common tasks, because then you can say, right, I know these people are doing clash detection. Let's give them a common environment. Yeah. Just bring the microphone.

AUDIENCE: I don't know if this is the right way, but I know for clash detection, a lot of times how I share it-- because we share the NWD file-- is as I go through the clash detection to the view, I pan out or zoom or whatnot, and then add it as a viewpoint, saying what clash number it is, so that this way I can export it out. Someone gets the clashes to view along with it.

LEE MULLIN: Yeah. Is that useful for people? Is that something they'd use?

AUDIENCE: Especially in-- like in our environment, we use-- a handful of people have the ability to see clashes. The rest of the staff [INAUDIBLE] we don't have an ability to see the clash views. So those viewpoints [INAUDIBLE]

LEE MULLIN: Yeah, and you know you can take those viewpoints with the overrides, and you can take those into Freedom, as well. So you don't just have to give them a report, you can give them the entire file.

AUDIENCE: I have something to add to that, actually.

LEE MULLIN: Yes, go for it. Yeah.

AUDIENCE: So when I do my MEP clashes, I'll do just a plan view by trade that has all their clashes circled in plan view, so they can just fly into it. Because I also-- part of my workflow is I export 2D plans and I put them at each level. So an actual architectural plan showing all the walls and everything, so you can have all the actual 3D elements turned off and still see the room numbers and know where you're at. And then you can see exactly where that is in plan view in relation to the actual building. Makes things a lot quicker, then you don't have to go through all the lists of all the viewpoints. You can just fly right into it.

LEE MULLIN: Yeah, that's a cool one. There's one at the back, could you pass that back?

AUDIENCE: I was just going to add a little variation to that. When you create your search sets, if you group them and then create a set from there, you can color code a set in a view and an NWD so

they're looking at, like, a hotspot view. It's all gray with red, but they don't need Clash Detective to see that. And you can do that real quick, that's something we use a lot.

LEE MULLIN: Yeah, that's a good one. So things like Appearance Profiler and overriding colors with search sets is something I've not touched on. It's something I would highly recommend, and I just forgot to put it into the PowerPoint, and I had quite a lot there. Does anyone have any tips around Appearance Profiler?

AUDIENCE: I'm a coordinator, that often I have large amounts of data from various trade contractors and sometimes they don't like to make the appearance how they're supposed to, and it's difficult to coordinate, you know, 200 miles of white pipe, white ducts, and white conduit, and white walls. So using the Appearance Profiler based on services and systems, where I can make all the DWV pipe one color and, you know, all the electrical another color, be able to run that down fairly quick and just save it out depending on what model I'm in.

LEE MULLIN: Yeah, so that's a really good example. So one of the blogs I was meant to write and never got around to because I got too busy, but I still could, have you seen the Google data centers? So the Google data centers look like a good Navisworks model, where you've got the hot water pipes in one color and the cold water pipes are another. You can use that to then standardize. And we see lots of projects where people have-- lots of companies where they use, every single time they do a project, they're always using this for hot water pipes, cold water pipes, electrical services, ducts. So everyone knows what that thing is before they even see what shape it is. So it's very useful. We've got one at the back we can read back to you, because I'm sure you've got a few more. She's good. Sorry, where was-- oh, yeah.

AUDIENCE: Another one is when you're trying to work in a coordinated effort, you can to have the model open and change the units on any such object so you can see, OK, if we move this pipe this way or moved it that way, where does it effect, run the clash on that and see if a solution works or not right there within the model.

LEE MULLIN: Yeah, that's a good one. Yeah, and just one at the end here.

AUDIENCE: I came across a tool called Clash Grouper, it only works for--

LEE MULLIN: We'll go on to that in a second. So yeah, I won't let you steal the limelight. But it's a good one. Yeah, so that's come out really recently. So what I'll do is I'll take maybe two more, and then I'll go back to-- yeah, so we've got one here.

AUDIENCE: We place scaffolds in these large construction projects, and the way y'all bounce around looking at clashes, we place tags at each scaffold also, and we label our scaffolds by the tags. So we can just bounce around a model and just go from scaffold to scaffold to find them real quick. Y'all could kind of use the tags to place at your clashes if you want somebody to go find them real quick.

LEE MULLIN: That's a good one. And one more there.

AUDIENCE: One thing we've been doing is doing an NWC out on DWG files. That way, the DWG files don't take so long to load up.

LEE MULLIN: Yeah, so that's one good point. It's more rather than kind of an advanced tip, that's something which I'd just recommend as a general tip. If you have the ability to export NWC from the program, so MicroStation, AutoCAD based products, Revit, ARCHICAD, I think that's it. It's been a long few days. If you've got the ability to export NWC, I'd suggest export NWC. When Basically the reason for that is, I kind of see it as you're in that program and you're creating a 3D snapshot of what's currently there. When you bring it into Navisworks, we're having to kind of create a fake MicroStation environment or a fake Revit environment, and then do the conversion. Now we know normally it's pretty good, but we know potentially there's mistakes. So what can happen is, say, for example in the case of Revit, is we have to essentially open Revit, then do the conversion. So it seems a lot longer than just exporting it straight from Revit. So it's a good tip, and it's definitely worth looking at.

What I'm going to suggest is anybody who has a tip and wants to include that, have a look at the Linoit and then you can just add post-it notes just with a description, or you can add videos, or you can add anything like that. And hopefully we've got a bit of the community here of people who want to learn more. And I'll talk a bit more about this later, but what I'd like to do is if you guys can contribute, the best ones we'll put on the blog. We'll make sure everyone knows about them. So that would be a really good way to kind of get everyone's skills up. So don't worry, this is in the handout as well, so you'll be able to download this later. I'll give you a second just to take photos.

OK, so the whole point of-- one of the things that Autodesk has always done is we've opened up our APIs, we've allowed other people to develop stuff on our tools. You know, there's a very good reason for that. We can't do everything. We'd love to, but we can't. So it allows, rather than kind of waiting for us guys to kind of do something, it means someone goes, we all need

to do this. Let's develop something ourselves. So we're going to show some of the tools which people use.

So this is a tool called BIMCAVE Search Sets. It's on the app store, the Navisworks app store. And it allows you to quickly create a bunch of search sets kind of based on the properties in the model. There's a few of these tools coming out now, I've seen maybe two or three come out in the last few months. And, you know, the things we're working on, we're developing something like this as well. But essentially, being able to create a bunch of search sets from a property or multiple properties within a few seconds is something that's hopefully going to really help your productivity. So this is a free tool. There's other paid tools as well. I can't vouch for which ones are best, but just to give you an idea that that stuff's there. Dynaworks. Is anyone aware of Dynaworks?

AUDIENCE: [INAUDIBLE]

LEE MULLIN: OK. So Dynaworks is based on Dynamo. I suppose the best way to kind of describe it is kind of visual programming. This is kind of an example we're going to be putting on the blog over the next few weeks, which is using the Navisworks clash detection tools and Revit to start automating things like highlighting where clashes appear within the Revit model, and also start doing things like automatically adding voids. So looking at every time you have a wall, a wall and a duct clash, we create a void around that duct.

So we're starting to kind of look into this ourselves. There's a guy called [? Adam ?] [? Cheever, ?] I think he's [INAUDIBLE] or something on Twitter. He's created this package, and you know, I know they're working on more scripts and more things to help you out with your clash detection. So have a look at this, you've got some really interesting kind of ideas of how this could work. And it's very kind of customizable. You can change the scripts, you can get what you need out of it. So it's interesting, and I'd definitely say this is advanced. This is more looking at clash avoidance, and then actually kind of almost autocorrecting your clashes. So it's a really interesting area to look at.

AUDIENCE: So can you access that script through [INAUDIBLE]

LEE MULLIN: So yeah, this script is definitely on the Dynamo packages website. If you just do a search for Dynaworks, you'll find it on there. You know, there's people who've been doing guides and training and those kinds of things as well. So this is using the Navisworks clash detection tool

to basically just run through and just verify that a load of these clashes have either been fixed or show that they're the same ones. So it's kind of interesting to help see how you could improve your clash processes, just bring it further upstream in the process.

Now we've got a thing called iConstruct, which is a tool that's been on top of Navisworks for a few years. It has loads and loads of tools. You know, the ones this year, it's got model compare, it's got things to be able to essentially break down your model. One of the kind of key tools which people like, and this is just a really basic example, where you can attribute data to a group of objects. So if you've got a number of search sets and you want to add classification later on, you can do that quite easily. So it allows you to kind of add information. But it also has, I would say, better database connection tools for Navisworks itself. So it's quite an interesting tool.

Now, one of the things that we know lots of people are using it for is essentially the thing that was asked about earlier, of cutting the model down. So either cutting the model down with properties, or cutting the model down with services. So if you've got one big federated model and you want to send out just the carpentry tender, you could cut it down to just those items that are in the carpentry tender. If you wanted just for steel work, you could just send out the steelwork, even if they're across multiple models. So it's quite clever.

So what we can do-- and just to give you an idea on helping the file sizes, this is a 25 megabyte NWD with 57,000 items. Using iConstruct, what one of the guys has used is brought it down to 5 and 1/2 thousand items and down to 1.2 megabyte file. Now, this can be really useful if you want to make the data more accessible, if you want to rearrange your model based on certain properties. So you don't like it coming in level one, level two, level three, level four, you want it to come in as doors, ducts, windows, walls, you can change that.

There's a project that was shown by Nor Consult on Monday where they basically used it to make it completely field ready. They took away things like the IFC file names. You know that the names can be quite horrible and not easy to understand. And just changed all the names to something which the guys on site are going to understand. So it can be used in lots and lots of different ways. They're exhibiting down at the exhibit hall, so if you're interested, have a look.

AUDIENCE: [INAUDIBLE]

LEE MULLIN: It's a completely separate company. It's not on the app store, we're trying to get them on the

app store. Yeah, so have a look on the website. It's just iconstruct.com, I believe.

AUDIENCE: So they didn't lose data, they've just managed [INAUDIBLE]

LEE MULLIN: So what they've done is they've taken out loads of data that no one uses, and then they've also taken out certain geometry which isn't necessary. So they've just made the model leaner in different ways. Yeah. So we've got another one which is a clash grouper, which I think was the one that was mentioned earlier. So this just allows you just to automatically group clashes by certain properties within the model.

So this is-- I think this only came out about a month ago. I've not seen it for very long. But here we're going to group them by level and then by another property. In this case, everything that is picked on the left hand side. So now we can see all the things on level 3S, level 1S, look at the different pipe types. So it can just be a much easier way to do that grouping, because I'm guessing that's a manual task at the moment.

AUDIENCE: And at the areas you can [INAUDIBLE]

LEE MULLIN: Yep, so that's quite a good one. Leica have got a tool which allows you to do clash detection against point clouds. You can do that in Navisworks, that's fine. But what the Leica also allows you to do is a thing called AntiClash. So you can start looking for items that have been modeled but don't exist in real life. So to give you an example on here, I'm not sure if it's got it yet. Yep, so here's the AntiClash. So this is a thing which is quite interesting, because it can allow you to then see which items have yet to be installed. Particularly good if you're thinking about MEP. So what it will do is you can see that this wall is modeled, but there's nothing there in the laser scan. So you can also check that the laser scan's complete. There's lots of ways you can use this. And we see there's a real uptake as more and more people use point cloud surveys.

And then a new tool again being exhibited. I think they're down by the construction space, and this has just been announced maybe two or three weeks ago, is one called Collaborea. Now, you've probably heard of tools like Solibri. This is intended to be Solibri on top of Navisworks. It's a rule-based checker based on the Navisworks data. So what this does is allows you to set up a bunch of rules based on certain properties or information, and then essentially view them in a series of ways. So it could be as viewpoints, it could be as issues on Building 360, which is their Forge-based platform. It could also be things like BCF as well.

So they're a really interesting company. They're currently translating to English. If you've got a need for this, go and have a chat to them. Because they're a really interesting company and they're definitely in those early stages of development where you guys can influence it. And I know there's a need for this. So it's something people do manually or spend a lot of time creating search sets to do, but it's quite an interesting one.

So one more poll where the internet connection is lost. So I think I know the answer to this. Has anyone not learned anything? Right, so I've achieved my objective. Is anyone going to give me a bad rating on the polls?

[LAUGHTER]

That's good. Is anyone going to give me a really good rating? That's good to know, great. Is anyone going to buy me a beer after all of this is over? OK, thank you. What I've got in the handout is I put in the link to the Linoit tools. Well, you know, the dashboard. I would like you guys to contribute. I know you guys use these tools every day. If you see something missing, put it in there. Hopefully this is a community where we can all kind of learn from each other. Because I don't know everything. You know, I really don't. There's stuff I found out earlier about the ways in which people use clashing, so it's great. In the handout we've also put a load of extra resources. So links to the blogs, links to some good training guides, and then also some of the books that are out at the moment. So I hope you all found that useful, and I hope you all have a fantastic OU. Thank you.