DEEPAK MAINI: OK, so what we might do is start with some introductions as people are trickling. We'll give them a couple of extra minutes. As I said, party last night. People would have had a few drinks, you know? It's hard to wake up in the morning. All right. So my name is Deepak Maini. I'm the national technical manager for Named Accounts at my company called Cadgroup. And if you haven't still figured it out, I am from Australia, Sydney. And that's why it's 2:57 AM in my clock. So 2:57 AM, followed by party last night, a few drinks. So you guys can understand where I stand, right? If I fall asleep, blame all this for the party. Not me.

All right. I thought I'd just put this slide in for no real reason. I realize that everybody just loves Star Trek. Everybody loves Darth Vader, and the storm troopers, and so on. So I thought to wake everybody up I'll just put this slide in for no real reason. As I said, my name is Deepak Maini. I am a qualified mechanical engineer. I'm also a guest lecturer at two of the main universities in Australia, namely University of New South Wales, and university of Technology Sydney. Both these universities I teach construction management to post-graduate, as well as graduate classes. I've been speaking at Autodesk University for a few years now. In fact, this is my sixth year.

I'm also an author. I've written a few books. So this book here is on a software called Navisworks. How many of you use Navisworks? Fantastic. So at the end of my book on Navisworks I have got a chapter specifically dedicated to Factory Design Suite. Basically, using Navisworks in the factory, and running from scratch all the way to the end. And this work here is on a software called Advance Steel, which is a steel detailing package. A lot of factories require a lot of structural work done, as well. So this book is all about steel detailing and things like that. Was anyone in my Advance Steel class on day one? I don't-- this gentleman here was. No? All right. No worries.

So [INAUDIBLE] I thought I'll probably do some because it's last day, 8:00 AM. You guys obviously had to put in a lot of effort to come to this class. So I'm going to give a few presents to you. I'm going to give away a couple of copies of my Navisworks books, and obviously, to win those books you'll have to answer some questions. So I make sure that I ask the hardest questions, so nobody could answer, and I could take the books back. Nah, I'm just kidding. I make sure that you guys get some goodies. So I'm going to give away a couple of copies of my Navisworks books that I've got in these nice bags here.

Bluebeam, thanks to them they have given me a few t-shirts to give away, and a few Bluebeam mouse pads. Anybody here uses Bluebeam Revu? Good. So you can grab a few mouse pads. The mousepads have got shortcut keys there so you don't have to remember good keys. And Pluralsight, they have given me a few caps, ear plugs, and a couple of power bags to give away, as well. So hopefully a lot of you guys will win things in this class. Especially people who sit at the front row. They get a lot of stuff anyways.

So without answering a question you get those. Sorry, you get [? a 2XL ?] [? tee shirt. ?] See? Anybody who sits at the front row has to be appreciated, right? Everybody wants to sit at the back. Nobody wants to sit at the front row. So we have to appreciate people. All right.

So my aim is to keep it simple, have fun. That's my aim. Have fun in the class. Ask a lot of questions. I like questions. Having said that, anybody who asks more than one question, I will charge you guys. Again, I'm just kidding. OK. First of all. Units and millimeters. Why? Because I'm from Australia. We work with metric units. A lot of you guys work with imperial here. I know you guys won't like it, but unfortunately that's how things work. How many of you work with metric? Oh, decent. Good, good, good. Imperial? Oh, good. Oh, you work with dual units, do you? OK. Brilliant.

This class is being recorded, which means that I have to be politically correct, and not say anything that's politically incorrect. But most importantly, you will be able to watch this class at a later stage or pass it on to your colleagues. It will be available under on-demand classes at the Autodesk University website. I'm happy to receive emails from the attendees any time about Factory Design Suite. I love the product. It is fantastic. And my aim in this class is to show you how easy your life will become once you start using the workflow.

Mobile phones on silent. Please, please make sure that mobile phones are on silent. I'll make sure mine is. Yes. Nothing more embarrassing than my phone ringing in the middle of the class. OK. So you guys, when you signed up for this class, you already know the class summary. I don't have to repeat it to you guys. But basically, we are going to talk about the entire Factory Design Suite workflow. A lot of people have got Factory Design Suite software, but they haven't seen the entire workflow from scratch, to a proper digital factory, where you could do walkthroughs and clutches and so on. That's my aim.

At the end of the class you'll be able to do all these things. Again, when you signed up you would have already seen these things. So you should be OK with this. All right. So in this

presentation I'm going to talk about three main scenarios. And at the end, we'll be able to plug-in the Oculus. People who just came in won't know this. But before I started my presentation I had my Oculus plugged in where you could actually immerse yourself in your digital factory, take a walk around, and see if there were some problems and so on. So hopefully, if time permits, we'll put the Oculus back on at the end. And if somebody wants to try it on I'm more than happy for you to do that.

So the first workflow that I'm going to talk about is the entire factory design workflow, as I said from scratch, to your original factory. The second one, which is an actual customer issue, is where we use this factory to resolve a problem where the building was done by an architect, and our customer, they dig pits and so on to service the machinery.

And the problem was when they were creating this machinery, with the pits and so on, sending the files to the architect, they were manually placing it, and the things were not getting placed at the right location. And it was causing a lot of problems for everybody. Especially once you started doing the excavation, and realized that it's not the right spot. It's not easy to fix those. Especially when you're cutting into a concrete slab. So we fixed that issue using Factory Design Suite. And the customer loves us. They are using it probably for the last six years, and they love the workflow.

And the third scenario is, again, Factory Design Suite, outside the factory environment. And so in this case there was a warehouse logistics solution company. The concept was, let's say, a big warehouse. It could be a DHL facility. It could be Targets, and things like that, where they want to put the racking systems in. The sales guy from this racking company goes in and looks at the massive lay out, and the client says, I need this many rows of racks here, and this many rows here, and things like that.

So this guy then, poor guy, draws it on piece of paper, comes back, gives it to the conceptual team. The conceptual team comes up with the concept. Then they send it to the client. Client says, yeah, looks good. But move this, move this, move this. I can't this red thing, blue thing, and so on. So the poor guy goes back and forth. And the turn around to get the basic concept in front of the customer was two weeks. In this case, we use the Factory Design Suite to bring that time down to one day. You would be amazed to see how this could be done. And I'm going to show you all that stuff.

And finally, as I said, if time permits, we'll put the Oculus back on, and we'll look at the virtual

reality stuff, all right? OK. So before all this Factory Design Suite came, out which now is called, by the way, Project Design Collection. So as all of you know, there there are no more suites that you can buy. You buy collections. So before Product Design Suite Collection came out, what happened? How did we lay out the factories? We used to AutoCAD LTs. How many of you use AutoCAD LT to layout factories? Some of us have, because that's was the only option available.

And then we used to X-ref all these 2D machine layouts, and other things, structure, services, and so on. And that made a really complicated drawing. And we used to look at those red, green, blue lines, unload, reload, x-ref, and so on, which was a big pain. So there was no real means of looking at the virtual factory to have a proper 3D model to see how the factory looks like. Do we have enough space in here? Where are we going to put this machine? Does it have enough power to service this machine? And so on. That was a big, big problem.

No option to check or resolve clashes. Clash is a big problem. I want to put a machine here but what if there is something protruding out of the wall, and I can't put my machine here? Which means that I need to move my machine, maybe 250, 300, milli-- or in your case, a few feet to the left. But then it's interfering with some other machine. Maybe I need some space cordoned off, which I can't do. So we can't run those clashes, if you're running that in the 2D environment.

So this is how our factories looked like before Factory Design Suite came out. And looking at this first thing I started getting is a headache. What am I looking at? Can't really understand. And imagine people who are not from design environment, who just sign the checks. Showing this to those people makes it really, really hard for them to understand what's going on. So this is where we need a better solution.

Is there a better solution? It's funny. My boss says I look like her when I'm grumpy. Which I'm most of the times when I'm working on this stuff. So is there a better solution? The answer is yes. And that better solution is Factory Design Suite, or as I said, what we call as Product Design Collection, now. So what we'll do is we'll look at this scenario one, where I'm going to show you the power of Factory Design Suite. So we are going to start with creating a 2D layout of factory. And now, please note that I'm using AutoCAD Architecture. Not AutoCAD.

Now, this guy doesn't get the t-shirt because he's a colleague of mine. He can get the t-shirt back in Australia, as well. We are talking about how people in the front row get goodies. You

know what? You can get this. Make sure you Return it back to me after the class.

So please note that I'm using AutoCAD Architecture, not AutoCAD here. And I will show you why am I using AutoCAD Architecture. You would be amazed what this program is capable of. Then we're going to use one to one sync between AutoCAD Architecture and Inventor. And this is where the magic will begin. This is where in one button click your 2D stuff would suddenly become 3D.

And then you can take that into Navisworks, and then have a walk through, and run your clashes. So we're going to create a virtual factory in Navisworks. And we'll perform our clashes between various items. Make sure that everything is fixed. And then we can send that model off to the client to have a look at, whether in the virtual environment, or on their tablet devices, or whatever it is. As I said, resolve clashes, and update the virtual factory.

So what I'll do here now is I'll sit down, and I'll show you this stuff on my computer. The problem is once I sit down I can't look at you guys in your eyes, which means that you might fall asleep. Make sure you don't do that. But that means that I might fall asleep as well. Make sure you don't let me do that, all right? OK. As I said, I'm happy to answer questions, but because we've got so much stuff to cover, if you hold on to your questions till the end, when we're talking about the Oculus, and so on, then I can answer all those questions, deal? You Unless it is an urgent question, without which you can't proceed further, than I'm more than happy to answer the question right away. All right.

So first of all, when you install Factory Design Suite on your machine it installs this, what we call as a dashboard. That dashboard has got these three tabs. On the applications tab it shows you all the different applications that are installed as part of your program. You also have got the Workflows tab where you can deploy a particular workflow. Like, I want to start with a 2D layout. I want to do a material flow analysis. I want to do a process analysis. And things like that.

There have been a few other classes in which they've discussed these things in detail. In my class I'm not going to talk about these things in detail, because I'm going to talk about the proper workflow between three main programs, which are AutoCAD Architecture, Inventor, and Navisworks. So what I'm going to do is fire up AutoCAD Architecture from here. So it loads AutoCAD Architecture on my machine. If I go in and start a new file now. So this is my AutoCAD Architecture environment. Looks like your proper normal AutoCAD, or AutoCAD LT

environment.

If I go to the Home tab here-- now, in the past you would have used these commands like lines, arcs, circles, and so on. Why do you keep doing that? So we have used commands like line [INAUDIBLE] circles, and so on, to draw your 2D layouts of the factory. Whereas, in my case, I'm actually going to use these smart commands like walls, doors, windows, stairs, and so on. Now you would notice that the concept is very similar to what you have been using in AutoCAD. And it looks like as if you are just drawing lines. But when I activate this wall command it displays this properties panel. But it's showing me all these properties of the walls.

Now, the process of creating this, you would notice, is exactly the same as if I'm drawing lines. But then instead of drawing lines I'm actually doing proper walls. So this is the exteriors walls. Also, that's 12 meters high. I'm going to start some over here, go down, punch in some values. Let's say, 16 meters going down, then I want to go left. So it looks like I'm drawing lines, because I'm using all these objects, snap trackings, and things like that. But the fact is, I'm actually not drawing lines. So let me just go in here, punch in, let's say, 80 meters. And then I'll right click, and say Close.

So it looks like I have simply gone and used line command to draw lines. So what it's done is used-- or create double line, which is what we've got in AutoCAD LT, at command called DLINE. In AutoCAD we've got a command called MLINE. So you would think that that's what I have done. But the fact is, that's not true. It's not just parallel lines. If I spin the model around, you will notice that it is actually proper walls that it's drawn of the height that I defined. If I change my display to, let's say, conceptual display, you can see that these are proper walls that I have drawn. Not just parallel lines. And if I double click on this wall, it gives me all the properties of that wall as well, just in case I want to modify any of these properties. Let me close out of that. I might just change the display back to 2D wire frame. And then let's go to the top view again.

Now, I want to draw some interior walls, so I'll go back to the wall command. Because it's an interior wall I might change it to, let's say, 4200, and then I'll use my object snap tracking, just like you would do in normal AutoCAD. So as you could see, all I'm doing is using my objects tracking, exactly the way you would do it in AutoCAD. Nothing fancy. But when I punch in these values-- so I want to go 12 meters here and come down. Snap onto this. So it not only draws the wall, it actually cleans it up, as well. And it's not just, again, parallel lines. It is proper wall of 4200 height that I defined.

So again, without changing my current workflow, instead of just using the line command. I'm using the wall command to draw these objects. Again, let's have some other walls over here going down 15 meters, snapping onto this one here, draws this one. And although these are wall objects I can use commands like copy, and move, and so on, that we've been using in normal AutoCAD to copy j things. So I'll save copy, click some over here. And I need three of these. I'm going to use the array option.

How many of you knew that there's an array option inside copy command? Did you guys know that? You know, all these extra AutoCAD tips, I'll be charging you extra for this. I shouldn't be showing you these extra AutoCAD tips, all right? All right. Just kidding. So I'm going to click some over here. I need to create three of these. So go down, type in, let's say, I need 12, 500 spacing, enter. And it creates those additional walls here. Spin the model around, and you can see that these are proper walls. Cleans up everything, and does exactly the way that I want it to look like.

So it creates all these internal walls. Let me go and change this to 2D wireframe. Look at the top few. The next thing I want to do is I want to place some doors here. So I'll go to the door command. And now it comes with a massive library of doors that I could select from. Let's say, this is the default door that I want. I'll go and pick the wall where I want to place the door. So just pick the wall here and it goes and shows me the preview of the door it's placing.

In the plan view, it looks like it is just a normal 2D door that we place as a block. The only problem is, if it was AutoCAD, or AutoCAD LT, you had to first trim the lines, and then put the door in, right? Whereas in this case, let's say I want this value to be 250 from the left, but it's showing me the value from the right, how do I-- and this is a question for the cap-- how do I change it to the value from the left? So I want 250 from left, not 10405 from right. You're not allowed to answer the question.

Now, I want to see how it's showing me 345 value here. I want this value to be 250. Quickly.

AUDIENCE: Tab?

DEEPAK MAINI: Tab. Yeah. Who answered first? You did? Somebody else at the back did as well. So we'll probably give away two caps. So one to this gentleman here. One there. And one to this gentleman here. All right, so all I'll do is I'll press the Tab key here. So by pressing the Tab key it switches over to this. And then I type in 250, Enter. So it places this door. The only problem

is the door is swinging in the wrong direction. You know how we have dynamic blocks in AutoCAD? You can flip sides, and so on? That's exactly what I'm going to do here. Click on this, and now it's the flip side, and it flips on to the other side.

I want to place the same door here. Again, because it's an AutoCAD based program, I could press Space bar, or Enter, to invoke that command again. And then I'm going to pick this wall. I'll press tab. Let's say 250 from here, as well. But again, I want it to open in the other direction. But instead of opening it in this room, I want it to open in the other room. So I'll go ahead and simply flip it, and now it opens in the other room.

So what it's done is it's placed all these doors here. Now, to further place things like roof slabs, and roofs, and so on, we've got all these smart tools, where you can place roof slabs, et cetera. You can go to the stair option to create stairs, railings, stair towers. You can even go and place columns, and column grids. So all these commands in built inside the program. Now, to save some time, what I've done is I've already created a factory that I'll open here.

Again, as you can appreciate, it's going to take a bit of time to create this from scratch. So to save some time I've already done this. If I go and turn on the visibility of the slab layer for ground slab. So this is the factory, and you would notice that when I change this to conceptual display now the door that looked like 2D doors in the 2D environment, or plan view, they're actually proper 3D doors here. So they are not just blocks that look like door swings. They're proper 2D doors here when I change this to a 3D view. So when I spin the model around, you can see that this is a multi-level factory. And the reason I'm creating a multi-level factory is to show you a specific workflow where we are going to create a spiral conveyor, and connect it to the next level.

I'm going to change this back to 2D wireframe. And also turn off, or freeze this layer, to make it a bit easier. Now, this is where, let's say we want to start placing some machines, and some conveyors, and so on. Again, in your normal environment you would go to your tool palette, where you have all your blocks for your machines, and so on, same, and you would drag and drop the blocks. Is that right? Or you would use the Insert command, and insert your blocks. Is that right? That's how we work? Yes? No? Maybe? Yep.

So what we're going to do is, instead of using the tool palette, this is where we are going to now start using a really, really smart tool that comes as part of Factory Design Suite called Factory Asset Browser. Now, Factory Asset Browser is similar to tool palette, but the difference

is it comes with a massive library of assets out of box. Now, you can also go and create your own assets, which is what I'm going to show you.

So in this tool palette, you would notice that there's a folder called, System Assets. Now, System Assets is the folder that comes out of box, where you've got this massive amount of folders, where you've got conveyors. You've got [? mechular ?] handling items. You've got process equipment, and so on. So if I go under conveyors, we've got belt conveyors, we have got chain conveyors. We've got shoe conveyors, and so on. All these conveyors out of box. You don't have to do it. The Factory Design Suite team has done a lot of hard work in the background to make it easier for you guys.

Now if I just go up one level, in my case, I also have my own folder here called Factory Library. Now what the concept of this is, what I did was I had all these machines done in Inventor. You know, how many of you use Inventor? All of you use Inventor. So obviously, we create our machines, or our assets in Inventor. Is that right? The problem is they're only available in the Inventor environment. Now, this is where in Factory Design Suite you can convert those machines into your factory assets. And in the process of doing that it'll let you create the 2D representations of that as well. And the best part is the 2D representation is linked to your 3D to representation. So you can place the same machine in the 2D environment, click a button, and that's where the magic is. Everything, when you go to the Inventor environment, converts into 3D machine. Alternatively, you can place the treaty environment in Inventor as a 3D machine, and you sync back to AutoCAD, and it shows you the 2D representation.

So that's my assets that we have. I use some of the artist assets out of the box to do this. And that's what you see here. Now, the reason I'm able to see this library here is because I went into my Factory Asset tab here. And now there are two options here. I've got a default project file, and I've got a project file for this particular drawing. Now this is red, so I'll just go and quickly pick up the project for this particular class, which was imper-- Yep. So because of this Inventor project that I've linked to this file here, whatever libraries I define inside Inventor, I can see the same libraries here in the AutoCAD 2D environment, as well.

So this is the product that I just added here. So, as I said, there's a default project file, and there's a current file project file that we can override the default with. Now, you would notice that there's also this little tick box here used to set Inventors active project. Now, a question for a power bank, any idea? What does this do? Quickly.

AUDIENCE: [INAUDIBLE]

DEEPAK MAINI: Exactly. So let's say in my Inventor environment I had a different IPJ file current. You know how in Inventor we have got projects, so I had a different project file current. By selecting this tick box it makes sure that when I sync back to Inventor, irrespective of what my project file was current in there, it makes this project file current. Otherwise, you know how we have this problem that is says, "missing library" and "missing files" and so on? This makes sure that does not happen for you. It automatically fixes the project file for you.

So because of having these files listed here, I can see my factory library folder. So this is what I'm going to do. I want to place some 2D assets from my factory folder. The problem is, let's say if I do not remember which exactly is the machine I want to place, I can go to any of these assets. I can right click on any of these assets. So for example, I'm going to go in here, right click on this, and say, Preview. It now shows me this little preview window that I can spin this around, as if it was a 3D object, to see how it looks like in the 3D environment. It also gives me some properties related to it. And as you can see, the property's telling me that it was an Autodesk asset created by Autodesk.

So this is the point I'm trying to make. Autodesk team has done a lot of hard work in the background, and created lot of assets for you that you can start using from day one. Let's say I want to preview this one. I'll right click on this. And it shows me the preview of this particular file. Again, I can spin it around. That's the asset I want. So all I'm going to do is drag and drop. So just like you do that from your tool palette, you're just dragging and dropping these assets.

Now, my problem is it's holding it from this particular base point, which means that it's-- let's say, if I need to place it at a particular location, I can't really do it. So this is where I can simply right click and change the base point of this, and say, I want to use this as the base point for this insert. And then in my case, I'll click over here. ' But if you wanted to use the from option, and say, I want to place it at a certain distance from a particular corner, or slab, or a column, you could do that.

Also for the next placement, it now uses that particular point that I changed as my placement point for the asset. And I can use my object snap tracking to make sure that I'm lining these things up together. So I'll place the one here. And then I'll place maybe a third one somewhere here, using my object snap tracking. So in this case, it looks like as if I'm just placing these 2D blocks. And again, this is something that we've been doing in the past. The only difference is

instead of placing the assets from our factory asset browser, we are just using our tool palette, or we are using the insert command. But in here we are using the smart assets available, our default factory asset browser.

And because these are like your normal 2D objects you can use commands like move or copy. Let's say I want to move this one here a bit. So I can simply use the move command, and move it. So the point I'm trying to make here is that there's nothing fancy. There is no change in your workflow that you've been using right now. It's not changing your workflow. So you're not changing your workflow. So instead of using your tool palette for your blocks, you're just using the factory asset browser.

Now, again, to save some time I've already got a file created, in which I've placed some more assets. So I've got these machines that I just place, and I've got some machines placed on this side, as well. And again, the whole idea is to save some time without affecting too much. Now, you can see that all these assets are currently placed on the ground level. There's nothing placed on level one of the factory yet. Everything is placed on this ground level here. Everything is 2D, except for my factory that I created in AutoCAD Architecture.

Now, the next thing I want to do is I want to place a conveyor line that goes between these machines. Now, normally if you've got, let's say the blocks for conveyor, you'll have to place each block at a time. Use the endpoints to snap onto those. Is that right? Whereas, what we are going to do, in this case, is I'll go to my system assets. And I'm going to go into the conveyor option. Belt conveyor is what I want to place. So we've got an option of placing these individual conveyors.

But there's a really smart tool available called Belt Conveyor Chain. Now, what this is going to do is it lets me create a chain of conveyors, as if I'm creating a thick 2D polyline. So I'll pick the point there, and I'll go and move the cursor, and I'll say, I want 80 meters of conveyor going in this. So it looks like as if I'm just creating a thick polyline. You know how we've got polylines that have got a thickness option, as well? So it looks like that's all I'm doing here. Just punching in a few values, creating thick polylines.

Most importantly, you will notice that my conveyors have got straight corners. So I've got 90 degree corners here, instead of they being curved. You know, the conveyors can't be straight 90 degrees. They have to be curved, right? Now, this is the best part, and this is what you're going to see once I convert this into 3D. What I might also do is probably just go in and place

another line of conveyors over here. So I'll start some over here, and go to the right. That's the line of conveyor. Let's say I want it to be 50 meters. Enter.

And then, finally, I want to place a robot. Now, I don't know that the robot is available. And this is where we've got this search option available here, where you can just go and type in the asset that you're looking for. In my case, I'm looking for robot, Enter. It goes and finds all the robots that are available in my factory asset browser. Now, you would notice that I've got some of these assets here, and I've got some of these assets here, which are these white circles.

So this is a question for a Bluebeam mouse pad. Any idea? What does this white circle mean? Yes, please.

AUDIENCE: [INAUDIBLE]

DEEPAK MAINI: Sorry?

AUDIENCE: Cloud assets.

DEEPAK MAINI: Absolutely. What it means is these are cloud assets. So what cloud assets means is Factory Design Suite doesn't want a massive deployment to be created on your machine, which is like 100 gigs, or something. So what they do is they provide you a big library of assets out of box, but there's a huge amount of assets also available on the cloud, that you can download, on need by need basis. You don't have to download all of them in one go. You can download them on need by need basis, by simply right clicking on them, and saying, "download assets." The best part is there's a little option here where you can move the cursor, and you can also look at all your recently downloaded assets, which is what I'm going to show you in a sec.

But in this case, I'm just going to place this existing asset, place it somewhere here, and then I'll rotate this. Yep. That looks good. The only thing is I might just move it closer to the conveyor. So I'll just use the move command. Select this, move it a bit closer. Yep. Looks good. Now, what I might do is just go in and place a palette here, as well. I know where a palette is. So I can directly go to that folder. Material handling, palette. Yep. There it is. And then I'm going to go and place one of the palette's that's already downloaded. Just place it somewhere here.

So this is how I want my 2D layout of the factory to look like at this stage. So all I've done is I've used some of the assets from my custom library. Again, the ones that were created an Inventor that had 2D versions, I've used use some chain conveyors out of the box, and I've

also used some more assets that were delivered to me as part of my Factory Design Suite. I'll go ahead and save this. And the next thing I want to do is I want to now look at the 3D version of this factory, because, again, as I mentioned, if everything is in 2D, it kind of defeats the whole purpose. So what I want to do is convert everything into 3D. And this is where I'm going to click on Sync Inventor, and that's where the magic will begin. And you'll see that in a sec.

There's also an option here called Sync Navisworks. I prefer Sync Inventor, because I can have a look at the inventor side of it first. So all I'm going to do is click on Sync Inventor. Here it says, in order to do this, it has to close its files. I'll say, yep. Go ahead and close the file, because I had Inventor already opened, it now loads this new file in this. Call it the same name as the name of my 2D file in AutoCAD Architecture environment, and starts to convert all those 2D assets into these 3D assets. And the reason it's done that is because the 2D version that I placed came from these 3D Inventor models. So as you could see, within no time, in a button click, it has now converted the entire 2D layout of the factory into this 3D environment, or 3D model.

If I just zoom into this area you can see all the machines converted to 3D, all the conveyors. Let's have a look at this now, and see how all the 90 degree conveyors have now been changed to curved conveyors. So this is what I was trying to tell you earlier. Although I'm placing them as 90 degrees by just typing in the values, when I convert them into 3D environment it automatically replaces the 90 degree corners by these curved belt conveyors.

Now, any idea why are some of these items red in color? So this is a question for the cap?

AUDIENCE: [INAUDIBLE]

DEEPAK MAINI: No.

AUDIENCE: [INAUDIBLE]

DEEPAK MAINI: Sorry, not-- who answered nonstandard? You already won something. You can't-- that's all right. I'll give you a cap, as well. All right. Give it to somebody else who answered. All right. That gentleman there. Thank you. Yes. So these are nonstandard conveyors. So when we create, or when the artist, he created the conveyors out of default, there was a default size. And anything that doesn't match the default size automatically changes it to red. So the whole idea is to tell you that these are nonstandard items. Are you sure you want these nonstandard items there?

So for example, in my case, I don't want this end bit here. So I can simply select this, press the Delete key on my keyboard, and it deletes that bit. However, you would notice that the underlying yellow object is still displayed. That's because I haven't synced AutoCAD yet. So yep, I'm happy with this. I'll go ahead and save this. So it looks good. Now, just one more thing. See how in the lower left corner it's showing me these two values? Any idea? What are these two values on the lower right corner? The first value, 61, and the other value 15.

So the value 15 means-- sorry. OK. You answer the question and I'll give you the power bank.

AUDIENCE: [INAUDIBLE]

DEEPAK MAINI: No, that gentleman there. Yeah.

AUDIENCE: [INAUDIBLE]

DEEPAK MAINI: Yeah, Search you're--

AUDIENCE: [INAUDIBLE]

DEEPAK MAINI: Unique parts, yes. So 61 are the total number of objects, and 15 are the total number of unique objects. So see I've got conveyors. So a unique conveyor is counted one in number 15, but it is counted multiple times and number 61. So 61 is the total number of items, and 15 are the total number of unique items. So I'm happy with this. I'm going to click on the Save button, and then I'll go and say, Sync AutoCAD. What it now does is fixes my AutoCAD file. And if I look at the AutoCAD file, you can notice that all the curved belt conveyors are placed here. So no more straight lines. And also the last bit has been deleted, because I fixed that in the Inventor environment.

So this is the ground level of this. Now, what I might do is-- let's have a quick spin around of this. I want to start placing some assets on the first level of this factory. So I'll simply use the ID command. Click on this, and-- what happened here? Press F2. Yep. So that's the z value of this height. I'm just quickly going to copy this, because I know you guys won't remember it. I'm going to go back to my top view. So I might just close this file without saving changes.

So going back into my Inventor environment. What I want to do is now start placing some assets on the level two of the factory. What I should do is probably turn off the grids so it's easier for you to see what I'm doing. Brilliant. So I want to start placing some assets on level

two of the factory. To create level two I'll simply go in here, and go and use this tool called Create Sub-Layout. What this does is it now lets me create a subassembly here.

So this subassembly, when I sync back to AutoCAD, will automatically be placed as an x-ref drawing into my master drawing. It automatically does that for you. So level two, it creates a new drawing with whatever name I specify here, and x-refs into my master base level, as well. So what I might do is change this to level two factory. I'll go and say, OK, define the location of my floor, right click, done. So what it does is takes me to this level to factory. As you could see, the same name that I defined in my ballot box takes me there. The only thing I'm going to do here is move this floor up, because at this stage the current level is sitting at ground level, level zero, as well. So I need to move it up.

For this I'm going to go into reposition floor, pick this here. It's showing me in inches. OK. So I might have to just highlight this. Now, any idea what the value was? See, I knew you guys wouldn't remember. So I did the copy there so I could just do a paste. Make sure that I type in millimeters. Otherwise, it's going to move it to 100 inches. Done. That's all I'm going to do here. Save the file, close it.

So if I go into the browser tree, you would straightaway notice if I could move it down, that I've got a subassembly here called level two factory. If I double click on this, I can go to the level two factory environment. But what I want to do is to first place a spiral conveyor that's going to take my raw material from ground level to the top level. We need to change the view to this view here, so it's easier for us to see what we are doing. So that's where I want the spiral conveyor to be placed. I can go back into my system assets, and I'm going to go to conveyor. Yep. And then belt conveyor is what I placed earlier. So I've got two of these left and right hand. I'm going to place a right hand one.

So as sort of like-- yeah, I'm going to just change to 3D view, so it's easier. You will notice that as soon as I come close to my existing conveyor, the spiral conveyor snaps onto it. And the reason it snaps onto it is that we've got what we call connectors. So connectors will make sure that you are snapping to the right place. We don't have to worry about constraining, and so on. You know, people who are coming from Inventor environment, you know how we have to worry about constraints, and so on, everywhere? You will notice that in the entire factory, as of now, I haven't talked about constraints at all, because we don't have to worry about constraints. It automatically constraints on the ground plane for you, the assets, and the ones that are on the second level, you'll notice that it will place it on the ground plane of that. And

when you are placing these assets we have got these connectors to connect them with each other.

So I'm going to place this here. It connects this. Looks good. Let's say done. Let's send it to this view here. So that's my spiral conveyor. My only problem is, if I look at it from the side view, it's still staying within this level. It's not going up to level 2, which is what I want. So what I'm going to do is go in here and look at factory properties. So a lot of these assets that are delivered to you out of box by the factory team have these smart values that you can modify. Again, inches. That's not good.

Let's go and change this to-- so anybody who came later, I'm from Australia, which means that I work with metric units. I don't understand imperial units. So this 72 and 101 and so on, that doesn't make sense to me. I'm going to change this to millimeters. By the way, it's not just me. There are a lot of people here who work with millimeters. So just don't blame me. Blame everybody. So I'm going to change this to millimeters. OK. Click on this. And I'm going to change this. Yep. So upper height here. I'm going to change this to the value.

So as soon as I press Enter, you will notice that it has now modified the conveyor. It takes me to this level. However, that's not what I want. It is supposed to go further up. Now, this is the question for a 2 XL t-shirt. Any idea why it did not take me to the height that I wanted? Why is it just touching the slab? So give it to-- any anybody here who could answer that question? No? OK. Good. So I get to keep the t-shirt. I can take it back for me. The reason is because there's a lower height of the conveyor, and there's a upper height.

So with the actual upper height, I also need to add the lower height to it. So 4419.6 plus 672 is 5181.6. Not that I remembered that value, because I practice this a lot. So that's how I remember. I'm not that good at math. So I just memorize this value.

AUDIENCE: [INAUDIBLE]

DEEPAK MAINI: Good question. I was hoping nobody would ask that question. The answer to that is yes. We could do that. All I could do is plus that value. However, I updated my Inventor, and it's not factory problem. It's Inventor problem. I upgraded mine Inventor recently, and that plus thing isn't working. I've already logged that with Autodesk. They are working on it. So the answer to your question is, yes. All I had to do was with that value I had to type in plus 762 Enter, and it will add that value. But I updated my Inventor, which has stuffed that up. I came to know this about a day before I left, or I came here.

So with this, as you could see, it has updated my conveyor. The only thing is I don't want my raw material to fall off the conveyor with just three revolutions. So I'm going to change this to, let's say, six. Enter. And it updates this. I'm happy with this. So let's close this option here. All right. So it now has taken the conveyor to the next level, which is what I wanted. The next thing I want to do is go and place some stuff on level two. So I want to add a cold belt conveyor here. I'm going to go to my level 2 factory. Go again to the conveyor. Pick the cold belt. Let's turn off the floor and grid settings first, so it's easier for you to see what I'm doing. So yep. That's where I want it. All right.

So pick the horizontal cold belt conveyor. Now, you would notice that when I come close to this, it is not snapping on to it. Unlike in the previous case when it snapped on to it. It's not stepping onto it. Yes, please.

AUDIENCE: [INAUDIBLE]

DEEPAK MAINI: Yes. If you want, you can define a user defined property. Or you can do a--

AUDIENCE: [INAUDIBLE]

DEEPAK MAINI: Yes, you can create a perimeter called Fluoride, and then you can just change the value there, and it updates everything. Yes. All right. So the point I'm trying to make here is that it's not snapping onto this conveyor. And the reason it's not snapping on to the conveyor is because the spiral conveyor is currently sitting on the ground level. Whereas, I'm placing this on level one. So to fix this, what we need to do is once I place this conveyor on level two, I'll have to now go, and what we call, is expose the connectors. The option is available under our relationship here. I'm going go ahead an say expose. It says, what connector do you want to expose? I'm going to pick this one. Done. And then go to my ground level conveyor, and repeat the same process. I'll go and say, expose this connector. Right click. Done. And now I'll be able to connect the two conveyor.

So let me grab this, and-- yeah, that's-- I remember now. So you've got to be a bit careful. Sometimes when you're dragging it, what it does is, it tries to pick it up from the origin point of your current file. So I might have to just drag it all the way here, and connect it. Yep. So works fine now. So by exposing these connectors-- and this was one of the main reasons I wanted to show you multi-level factory, as well. To show you the concept that if you want to connect

things with multiple levels, you'll have to first expose the connectors. Once you expose the connectors then they'll work fine, no worries.

All right, now I've placed this conveyor here. And as you could see, that gets placed inside my level 2 factory. Going back in here. I want to now place some assets. So I want to place some machines. Those machines were downloaded as my cloud asset. So instead of finding where those machines went, I'm going to simply use this option called Recently Downloaded Cloud Assets. It shows me all these cloud assets that I recently downloaded. All I need to do is now drag and drop, just like I did in AutoCAD environment. I can also have a look at the preview. Again, similar to what I did in the AutoCAD environment. I can have a look at the preview.

So this is what I wanted to place here. But in this case it is placing it as a proper 3D model of this machine. Now, I'll place it here. And let's say I wanted to rotate this. So use the rotate tool at the same time. Just move it a bit this side, as well. Yep. That looks-- So I placed one instance of this machine. I want to place another instance of this machine. So I'll place it somewhere. Here. Again, I'm going to rotate this. And then-- yep. That'll do.

So, it's placed this machine, as well. But notice that these two machines do not line up. And again, if you are using normal Inventor we had to use the flush constraint between the faces of those machines to line up. Is that right? Is that what we do normally in Inventor? But not with the Factory abilities. And this is where this is really, really smart. To line these up all I need to do is go and use this tool called Align. Align tool that says, what component do you want to align? I'll say this one references this one. And it says, how do you want to line it? I'll say, align them horizontally.

So as soon as I pick this button it now lines them up horizontally. I don't have to worry about applying constraints and so on. So this is the best part of this program. Because we are doing a general arrangement, we don't have to worry about applying constraints, and then five days later figure out what constraint in that applies, how do I fix this, and so on. We can use these really smart tools that are provided to us as part of this program to create a really, really quick general arrangement of our factory.

AUDIENCE: [INAUDIBLE]

DEEPAK MAINI: They won't stick. No. But again, if you want to-- for example, if I need to move, what I might do is I'll just move it this side. Let me place another machine, and I will show you how we can move all of them together, as well, just in case something needs to move. So what I might do

is place another machine here. So let's go back in here. I'll go and pick the machine that I want to place, which I'll use wire EDM. So all these assets that you see here were cloud assets that were not automatically installed. Again, as I said, they want to just keep the installer size as small as possible. And then anything extra that you need they just let you download as part of your cloud assets.

Just move it somewhere here. Yep. Done. I just have a feeling that I changed the orientation of this. Yep. That's what I did. Let me fix this first. I'll go back in here. So to change the orientation of this I can just go back and use reposition. Specify where I want my triad to sit, and then rotate this 180 degrees. And then move somewhere, let's say here. So what I want to do is I want-- as this lady here said-- let's say if we want to move all of these together, I can do that. Let me just make sure that it's sitting. Yep. So all of these things are sitting at their right location.

Before I move this, what I might do is go and add a few more conveyors. So let's go back in this. Now, because this is a subassembly here, I can also open this subassembly separately, so I'm not looking at all the extra bits that I don't need to see. So see how in this case it's lot easier for me to see what I'm doing, without looking at the lower level assets? What I want to do is add some more conveyors. So I'll go back into my system assets, conveyor, belt. Let's pick the straight belt conveyor here.

Now, because this is a 3D environment, we'll use these connectors to connect these conveyors together. Yep. Let's do this. I'll now go and add a curve belt. So place this curve belt here. Yep. Fantastic. So this is a good thing. So it looks like these curve conveyors are pretty close to my machine. So what I do is I want to reposition all these machines.

And as this lady said, because they're not constrained, if I move one the other one will move with it. So all I'm doing is I'm picking all the thee machines, and then moving them together back a bit. So I'll just go and use this direction, move these back a bit. And that's all I had to do without worrying about the constraints. Now, I'll go and add a few more straight belt conveyors. So click, click. And all it's doing is it's making sure that all these conveyors connect together with the right location, and also the orientation of my motors, and so on. I'm happy with this. I'll save the file. And let's close this. And I can now see my level two factory looks like this.

Now, again, the whole idea I'm showing you this level two stuff is for a couple of reasons. One,

I wanted to show you how to connect spiral conveyor from one level to the other. And the other one I wanted to show you was the subassembly bit. This way you can have a particular area of your one level, also created as a subassembly, just in case you want to keep them separate. Maybe there's a particular supplier that has supplied all the machines in this area. You could create a subassembly there, and then have that subassembly kept separate. So that way you want to edit that, you can edit that separately as well.

So this is how my microlevel factory looks like. I'm pretty happy with this. As you can see, things sitting on the right level, exactly where I wanted them. I'm going to go ahead, and say Save. And then I'm going to go and sync my AutoCAD file. So I sync my AutoCAD file. It now says, "Do you want to open it in AutoCAD?" I'll say, yes. And you'll straightaway notice that now I've got the assets placed on the next level, as well. I've got my first level assets and so on.

But one of the things that you will have noticed is in my Inventor environment, the building of the factory came in as a reference. So it was only wireframe. That's because we want to keep the file size smaller inside Inventor. We don't have to get all those factory's buildings, and so on. However, if you want to use the references by snapping onto those, you can do that. You can snap on to those reference items.

Now, the whole concept of doing that is if I just turn on the slab layer, I want to create my digital factory in what we call our Navisworks environment. I'm going to just close all the files here. So close all. Not going to want to Save changes. So going back into my dashboard, I want to now create a digital factory to do my engineering review. And for that I'll simply go to this option called engineering review. When I click on this engineering review, it's starts to load Navisworks, and it says, what is the file that you want to open?

Now, you remember how I've got my DWG file for my factory, and I've got my Inventor file for my machines? What I'm going to do here is I'm going to go and pick the DWG file of my factory. So I'm simply loading this DWG file of the factory, but as I'm doing it it's not only loading the DWG file-- I think it's just [INAUDIBLE]-- It also loads the linked Inventor file. I don't have to separately load it. It understands the link between my factory DWG file, and the Inventor assembly file with the machine layout. So I open the DWG file, it automatically loads the assembly file as well for me.

Let's have a look at it in the 3D environment. I'm going to just fix the display. Let's change this

to shaded. I might change the background to horizon as well. OK. Let's change this to scene light. So now, suddenly, within no time, I've got a proper digital virtual factory, that I can now walk around. I can have a look at the actual stuff going on. Let's turn off the line work, as well. You will notice that it not only loads the DWG file. It also loads the assembly file for me, which is what I'm saying. Factory Design Suite understands the relationship between the file. If you load one, it loads the other one as well. You don't have to manually do it. Again, saving you time in figuring out where those files are.

So what I'll do is-- let me spin the model around-- I'll go and zoom into this here. Let's turn off the snap points, as well. Just zoom in here. And I want to start walking into my factory. Come down to this level. Now, people who have used Navisworks they will understand. Anyone who hasn't used Navisworks, if you haven't, I would strongly, strongly recommend you guys to have a look at Navisworks. It is a fantastic program. Lets you create digital factories within no time. But most importantly, you can have a walk through of your factory. You can even turn on what we call our third person avatar. So I've got a third person avatar turned on here. I can also turn on gravity and collision. So collision makes sure that I'm not going through walls, and so on. And gravity makes sure that I'm always walking on the ground plane.

So I'll start walking in here. So as you could see, within no time I've created my digital factory, starting with AutoCAD Architecture, machine layouts placed inside Inventor, and within no time I've got my digital factory. Imagine doing this in AutoCAD. First of all, you can not do it in AutoCAD. And if you try doing the extrusions, and so on, it's going to take you ages to do this. So what I'll do is quickly save a viewpoint here. I'll call this as walk, if I could spell it right. Start, enter.

Now, I might just start walking. So I can start walking around in this digital factory, and have a realistic feel of how my factory would look like. Now, the good thing about Navisworks is Navisworks is not only just a visualization program. It's also a design review program. So the point I'm trying to make here is, let's say, there are some curve belt conveyors, the red conveyors here. I can create a red cloud here, highlighting these red conveyors, and add a little text saying, "Why are these conveyors red in color? The reason why are these conveyors red in color is because, maybe, as I said, it could be custom assets. Or there could be something else.

But by me making this up, and sending it to someone, they would sort of know that they need to address this. I don't want these custom sizes available here. I want these to be the standard

sizes so I don't have to worry about these. So people whose who are designing these general arrangements can go back and fix this. So similarly, if I continue starting to walk, in one click I can go back to this particular viewpoint. And in that particular viewpoint I've got this red line markup. I'm going to just rename this to Red Line. Enter. So in one click I can go to walk start. In one click I can go to the red line markup. And that's the whole idea of having all these different viewpoints created.

Let's continue walking in this area here. Discreetly check the time. OK. So what Navisworks altered does is, it's not just a design review tool where you can add markups, and so on-- I'm going to just turn off the avatar-- you can also distance measure things and so on. So for example, I can go to measure distance tool, and I can say I want to measure the distance between, let's say this face here, and if I could get this face here. And it not only gives me the distance. It also gives me the x, y, and z value. So it's giving me the x, and y, and z value of the distance measure as well. So not only just the incline distance. But all these distance values.

Alternatively, you can also use an option called minimum or shortest distance where I can pick two items here. So this one and this one, and I'll go ahead and say show me the shortest distance between the two. And it shows me the shortest distance. This is generally handy when you've got things like pipes, and so on, and you want to find out if you have enough clearance between your machine and the pipe work for the servicing people to go in and service your machines.

I can also convert this measurement into a red line markup. Then it goes and creates a viewpoint for me. I'll rename this to distance. And then going into that distance view it straightaway shows me the distance value. Now, maybe there's a critical value that I need to meet. Maybe there's minimum 2 meter distance for the servicing. So I can create this as a red line mark up. Again, red cloud this, and send it to the people saying, I need more space here.

If I just go back into this viewpoint, and I'll continue walking. So let me just walk here. So I can see that my spiral conveyor is actually interfering with my slab off the second level. So again, I can go in here, and I can go and start creating, let's say, a red cloud. Let's just go and create a little red cloud here, and add a text where I'm going to go and say, need to cut a hole in the slab. OK. And now it adds this red line markup. Again, I can go and rename this to, let's say, red line. Yep.

So in one click I can go to this particular markup, and see what's going on here. Now, in this case there was this thing that I could visually see that there's a problem. But there could be other clashes that I can't really figure out straight away. So for that we are going to run clashes between our building and the machine. What I might do first is go and create an overview viewpoint. Turn off the avatar. I'll go and create like a 3D view-- let's actually look at it from this direction. And I'm going make the walls transparent, as well. So just pick one of those walls. Go in here. Select type. And then I'm going to change the transparency of this. The whole idea is I want to be able to see inside the walls. So it looks good. And then I'm going to go and say this as a viewpoint called Overview, and then make sure that it's saving the appearance. Yep. Yep.

So what I want to do now is, let's say-- yep. So all of these viewpoints go to overview. Looks good. I want to run the clashes between various items. Might hide the save viewpoints window. Go to my clash detective window. And then I'll say I want to add a clash tester. Let me just resize this quickly. Add test, and I want to call this test as Building versus Machines. And I'll pick my DWG file here, and I'll pick my assembly file. And then I'll go and say, hard clash. Run test.

And then it shows me that there are these seven clashes found now. So it straightaway figures out what other problems I've got in my factory, and highlights those. And this is what I was saying. Anybody who doesn't use Navisworks, please make sure you start using Navisworks, because these things you cannot visually find out. I'll go to this clash here. So again, the conveyor going through the wall. Yep. Yep. Aw, this is something I did not realize that we'll have, OK? So that's a problem.

What's the next one? What's this. Let's have a look at-- ah, I know what it is. Maybe what happened was when I created the assets for this factory, instead of using the bottom face of the stand of this, I might have used a different face. And that's why the machine is interfering with the ground slab. That's why those two items are highlighted. So what I might do is-- this may not happen in the real world. So that is not possible to have. Make sure that's the case. Yep.

So what I'll do is I might just go and manually say that this clash I'm going to resolve it, or approve it. Approve it not resolve. So what this means is that I know that physically this is not possible. So I've manually gone in and said, don't worry about these clashes. This has been approved. Ordinarily I could go back and fix this, but these clashes are a problem, so I'm going

to fix those. To fix these clashes what I'm going to do here now is I'm going use a really smart tool inside Navisworks called Switchback.

So this is the file that I need to fix. I need to pick this file and click on Switchback. What it does is load the same file in the AutoCAD Architecture environment. And also takes me to the exact same view that I was in Navisworks environment. Now, the only thing is in this perspective view it doesn't look that good. I'm going to change this to-- let's [INAUDIBLE] this to plan view, and I might change-- yeah, it doesn't look good-- change this to [? Pavlov. ?] So what I want to do is first of all cut a hole in the slab. So for that I'll go into the my slab. So let's zoom in. So this is this lab I need to cut the hole in. Yep. That's a second level slab. All I need to do for this is I'll go and activate the rectangle command, and I'll draw a rectangle. Doesn't matter where the rectangle is sitting on the ground plane, or whatever it is.

Now, I simply go and pick the slab, and use this tool called Hole. So when I pick the Hole tool it says, what do you want to do? I'll go and say, add a hole in the slab. Pick this rectangle. Enter. It says, do you want to delete the rectangles. I'll say, yep. So what it does is it actually cuts the hole in the slab. So I don't have to manually do a extruder or things like that. It uses this whole option inside the slab tool to go and cut the hole in the slab, which is what. Let's change it back to the wireframe, top view.

And then I'm going to go and-- let's freeze this layer, yeah-- I'm going to go and freeze this layer so I can see it a bit better, and create a little opening in this wall so that the conveyor could go through it. And for that I'm going to use this tool available inside door called Opening, pick the wall in which I want to create the opening, and specify where I want to place it. I want to play it over here. Sounds good. And then enter. So I'm happy with this. I'll go ahead and save the file. Yep. Looks good. Save the file here. And then close the file.

Now, going back into my Navisworks environment, at this stage it doesn't tell me that my clash test needs to be updated, because I haven't refreshed my model yet. So all I need to do is click on the Refresh button here. It now reloads the DWG file, and straightaway tells me that my crash test needs to be updated. I'll go and click on this and hit update. It now straightaway tells me that there are five clashes that have been resolved. Two are still active. So these five clashes have been resolved. And if you look at the results area you can see that these five clashes have been resolved.

There are still two clashes actives, which is this one and this one. The reason I did not fix

these clashes is because I don't think it's a good idea to fix this particular one right now, because we don't want to cut our wall. It's easier for us to move the spiral conveyor a bit further up. So what I'm going to do is instead of fixing or worrying about fixing any of this stuff I'm going to simply go into my clash here, and right click on it. And I'm going to add a comment. And I'll simply go and say, let's be nice to this. So for this clash it is better to move it maybe out a bit. Yep. OK.

So it adds a comment to this. And you will straightaway notice that there's number one symbol inside the comment. I'll do the same thing with this one here. And I'll go ahead and say this is still pending, because we don't know when we move the spiral conveyor what happens to this one. So I'm going to leave these active. The whole idea is I know that I've got something to go back to. And having a comment will make sure whoever's looking at my file will be able to go to those comments, and see what they need to fix.

AUDIENCE: Are they easy to see all the comments, or do you have to dig?

DEEPAK MAINI: Good question. Really good question. And for this I'll give you-- do you want a mouse pad, or do you want a earphone.

AUDIENCE: Earphone.

DEEPAK MAINI: OK. So the answer is yes. There's a window inside Navisworks called comments window where you can see all those comments. Now, in our case, we can also go and generate a report. So by generating a report it generates a report of all your clashes, and those comments will be available inside those reports of the clashes as well. You can generate the reports of all the tests. I recommend [? hash team ?] or tabular format, because it is, in a proper table format, a really, really nice report.

So I'm going to save this file here. Let's say complete factory. So what I've shown you just now is an overall Factory Design Suite workflow where we started from AutoCAD Architecture. We placed some 2D assets inside AutoCAD Architecture and then those assets were converted into 3D sets. So the next bit that I want to show you is the [INAUDIBLE]. But before I get there I might just go, and just quickly. We are running really short of time. As I said, it's better if we ask the questions at the end, if it's OK with you, because we are really running short of time, and I've got a lot more stuff to show you.

So as I said, in this presentation here, what I've shown you is an overall Factory Design Suite

workflow, where we started with a 2D factory layout. Although, it was not really 2D. It was 3D walls, and so on. We placed some 2D assets there, clicked the button, and suddenly magic happens. I really like using word magic, if you haven't figured it out yet. So it converted all the 2D assets into 3D assets. And as a result, we were straightaway able to have a look at all the 3D assets. So that was the overall Factory Design Suite workflow. A lot of people have Factory Design too, but haven't seen the workflow, and that's why I wanted to show you that as a first thing.

Now, in the second part of my presentation I wanted to show you a big problem that one of our customers had, which was resolving the lack of information issue. Let me just quickly go back to this. That's the [? bid. ?] So you know, when you've got multiple teams working in a coordinated environment, unless you talk to each other on a regular basis, chances are the project may not come together at the end the right way. For example, this one here. I really like this picture. I downloaded it some-- I think from LinkedIn. Somebody posted it on LinkedIn sometime back.

So we had a customer. And it's a real customer issue. They create pics and platforms. And the building is created by the architect. So to get this right the problem they were facing was they would send the DWG file off, the [? pits ?] and the machine sensor The architect would then manually place it. Wouldn't get the placement of the pit right, which means they would start excavating at the wrong location. Especially when you're cutting in the concrete slab, and then realize that this is not right. So to fix this workflow we went and used factory design sweet. And what we did was we had the Revit model exported to as a DWG file. We got the DWG file into AutoCAD architecture, placed the assets at the right location. We use, by the way, A36- Drive. You've got Autodesk software subscription, meaning you can get Autodesk 360 Drive access with 25 gigabytes of space free. If you haven't used it, I would strongly recommend you guys start using it. Then we got that AutoCAD file into AutoCAD Architecture environment. Used our Factory Design Suite concept to place our assets, and pits, and so on. And then we took it back into the Revit environment.

So let's have a quick look at our presentation on this. So this is currently the Revit environment. And this is the building that we used for that particular build. So all we had to do was export that building as a DWG file. If I go and open that DWG file here-- so I'll open this one. So this is the same DWG file coming from Revit. So as I said, RVT file exported as a DWG file. At this stage, this is how it looks like. Now, again, to save time what I've done is

created a couple of layer states. And I've already placed some assets.

Again, I don't have to show you this because I've already shown you this bit. I'm trying to save some time. So I've already played some assets on the ground level, but I've also placed some assets on level two. Now, there is one main reason I'm showing you level two as well here. And the reason is when we are placing it in Revit, how do we place them? So there could be some machines from your level one that are going to level two. There could be pipes linked with them. So where are you drilling holes on this wall? Where are you drilling hole on the other wall? To get this workflow right you need to make sure that you're placing level two assets at the right location. And that's why I'm showing you this workflow here.

So how did I place these items on level two? All I did was use this command called Elevation. So if I identify this here, it's 4,200. So inside AutoCAD we have got a command called Elevation where you can type in the elevation value here, which means anything that you drag and drop or you draw goes through that height. Has anybody used Elevation command inside AutoCAD? Yep. Brilliant. So just make sure that you are placing the stuff at the right level.

Now, I'll change it back to zero because I want to place a pit at level one. So I'm going to go back to this layer state called level one. I'm going to change this to the wire frame. And then let's go in to the top view. So what I'll do is I want to place a pit here. Again, instead of finding where the pit is, I type in the search, press Enter, and it shows me all of the pits that are available out of box. So these are all available out of box. I did not have to create them. I want to place a rectangular pit. But this is where the important thing is. This pit needs to be placed at an exact location from the corner of the slab. This is the key bit here.

So what I'm going to do is change the base point, just like what I showed you while placing the machine earlier. I'm going to pick the base point here. And now I'd say it needs to be at a distance from this corner point. And now I can type in a value, add 2500, come up 1410 from memory. Enter. And it places this 2D version of the pit exactly where it's supposed to go. So if I did not have a reference to the architect's model there is no way I could have used it, because they might be using a different coordinate for the building. So it's not zero. Or it could be something else. By using the reference of the slab, I'm making sure that I'm placing it at the right location.

So once I've done this all I have to do now is sync to Inventor, just like what I showed you in the previous case. And it'll convert everything into the 3D assets. But again, to save some

time, I've already got a file created inside Inventor, so I might switch over to that. And if I go ahead and open that file inside Revit, this one here. So in this file, what I did was I already did a sync, because I wanted to save some time. Again, I keep saying save some time because there's so much I want to show you guys. So I've already synced this particular file. You will notice in this particular file I've got this physical floor placed. And the reason it has placed a physical floor is because when it syncs a file with a pit, it needs to do some cutting in a physical floor. So that's why it puts a physical floor in. So you could see that there was a cut done in that physical floor for the pit. So that's the floor. And that's our pit there.

Now, what I also did was, to again save some time-- yep. So as you could see, pit here, level one assets on level one, and level two assets on level two. So let me just finished here. So as you can see, I've got a level two subassembly here. Now, the question is how did I get a level two subassembly, because in the AutoCAD environment I just placed everything in the same file. All I had to do was go and create a new sub-layout, by using the sub-layout tool. It creates a new subassembly. And then I had to simply drag and drop the level two assets inside the level two subassembly. You know how in Inventor we can drag and drop items? That's all I had to do in this case.

Now, again, the reason I've done this is so I could now go and create two level of details. I've got a level of detail called level one, in which I've got only level one assets. I do not have floor. Do I really need to take the floor inside Revit? The answer is no, because they already have their floor slab, right? I don't need to take the floor. That's why I've turned it off, or I've suppressed it. Similarly, I've got level two, a level of detail created in which I've got level two assets only. I did not turn off the 2D object. That's fine. No worries. So that's my level two.

Now, what a lot of people would do is, if they need to export something from Inventor into Revit, they'll go into this BIM exchange involvement, and they'll say, all right, let's export this as-- what does that say? Yes? So they'll say, let's export it as an ADSK file, or an IFC file. But the problem with this is, that person placing it inside Revit will have to manually place it, which kind of defeats the purpose. The whole purpose is no manual placement inside Revit.

So sometimes, as they say, keep it simple and straight, that's all we had to do in that workflow. We just went in and exported these two level of details as DWG files. So going in here, export, export a DWG file. I'll rename this to, let's say, level one assets. I'll make sure that I'm only taking 3D solids. No surfaces. No sketches. Because that's all I want. OK. And then I'm going to go and say Save. And it saves this file. So it creates a DWG file. I do the same thing with

level two sets as well. I'm going to go and export this as a DWG file. Let's go ahead and call this as level two assets. Make sure that I'm taking only the solids. Nothing else. OK. Save.

So I've created the two DWG files. I'm going back into Revit now. What I'm going to do is I'm going to link the DWG files. Now, why am I linking the DWG files? Any answers? This is for the 2X t-shirt? Why am I going to use the link? So what I'm going to do is-- this is my Revit file right now. And let's say I want to place the assets on level one. So in Revit, you know how we have an option where we can place, or we can link? So anybody uses Revit here? I know you do. OK. So inside Revit we can place them, but I'm going to use this link CAD format. Any solutions? Why am I doing that?

AUDIENCE: [INAUDIBLE]

DEEPAK MAINI: You can't answer. You already got the t-shirt. Sorry. Who was the other person?

AUDIENCE: I don't need it.

DEEPAK MAINI: Yeah. So--

AUDIENCE: So it will up your [INAUDIBLE].

DEEPAK MAINI: That's right. So the whole idea is if my machine layout changes, I just export the DWG file, and inside Revit they just update the link. That's the whole idea of exporting this or a DWG file. Is it right? Right.

AUDIENCE: Why not use ADSK?

DEEPAK MAINI: OK. With ADSK you have to manually place it. It's hard. Plus the export, it may not take all the smart metadata that you want as part of your-- it will take a lot of metadata, but it makes sure that, in this case, you don't have a manual intervention. And I'm going to show you that in a sec. So I'll go ahead and say, I-- I'll select the, I said, one DWG file. This is the key here. The key is I'm not going to touch anything. I'm going to use auto origin to origin. Whereas, ADSK file, you'll have to manually place it. Whereas, in this case, as you could see, I'm going to leave it as a default one, which means there's no manual placement. And that's exactly what we wanted. Is it the time already? You've got to b kidding me.

All right, so I leave it as origin to origin, level one. Orient the interview. And I'm going to go ahead and say open. It takes a few seconds, and loads my DWG file. And as you could see,

without manually placing it where it goes, it places my pit exactly where it needs to go. If I look at the inside view you will notice that it goes exactly where I placed it inside my AutoCAD environment. So no manual intervention to do all these things. Level one, opposite view, the machines go exactly where they're supposed to go as well.

Similarly, if I go to, let's say level two-- let's close these views. And I'm going to go to level two. I want to place some assets on level two as well. So again, I'm going to go into manage lengths, and I'll go to the CAD format, and I'll go and say, add. Pick level two. Now, this is the important one. I'm going to go into origin to origin, and place at what level? So this is the question for the book. So people who came late, I've got a Navisworks book, in which I've covered the entire Factory Design Suite Workflow, for Navisworks at the end. This is the question for the book. Do I place it at level 1 or level 2? Yes, please.

ANDY: Level two.

DEEPAK MAINI: Level two? Wrong. Because if I place it at level two, 4,200 from level two. You were answering?

ANDY: They wouldn't be able [INAUDIBLE].

DEEPAK MAINI: Exactly. You've got to place it at level one, because it's already at level two from level one. So the book to the gentleman here. He has the book. All right. Congratulations. What's your name?

ANDY: Andy.

DEEPAK MAINI: Andy? Good on you, man. So what I'm going to do here is I'm going to select level one here, because it's already at 4,200 from level one, and I'll go and say Open. It loads it at level two. And when I go and say, OK, you can actually see here it places all these assets at level two. Not level one. And if I look at the inside of level two that's exactly where I wanted these two objects. And this is specifically the reason I showed you level 2 as well, because there could be some machines that are connected to level two machines through pipes and so on. So you might have to cut holes in the slab or holes in the wall. And by using this workflow you make sure that everything is done at the right location. You're not just making things up, or finding the distances, and so on.

So this, as I said, this workflow, our customer got really, really happy. Level one, assets went exactly where level one assets were supposed to go. Level two assets went exactly where

they were supposed to go. And if I spin the model around, I can see my pick going exactly where I want it to go. So this made sure that there was no communication issues. No dramas. People manually placing things and so on. That did not happen. So this is, as I said, a specific customer worked for that we used Factory Design Suite outside the factory environment to fix a real problem. Let me close this file as well. So I'm going to save this. And yep.

All right. So the last workflow that I want to show you as part of the Factory Design Suite is the third one here, which, again, is a real customer issue. One of our customers, who is a warehouse logistics solutions company, as I mentioned at the start, the sales guy goes in, and then draws a rough layout, and so on. Whereas, using the Factory Design Suite, what the sales guy does now is he goes on site, and uses his AutoCAD 360 on his tablet device, draws a rough layout of your warehouse, use AutoCAD 360 Drive to send the information back to the team in the backend office, and the backend office uses that as a reference to create a 3D version of the warehouse, with the racking systems, and so on. Pushes the same model onto a A360 Drive, and the client can view it on their tablet device in less than a day. So the turn around period went from two weeks to less than a day by using this Factory Design Suite workflow.

All right. So let's have a look at the presentation of the software. So let's go in here. So what happened, as I said, was the sales guy goes on site, and uses AutoCAD 360 on their tablet device, and creates this rough layout of the warehouse. So all he's doing is drawing some linework, putting in some text there, that this is the land, this is the work. This is how many racking systems you need, and how far apart, and so on. Now, inside the AutoCAD Architecture environment I can use this design tools palette, and I can simply right click on the walls tool, and say apply the style to the linework.

So I can simply pick this work that the sales guy created on the tablet device, or salesperson, created on the tablet device, and convert this into proper linework. But I don't want to do that because this may not be accurate. So what I would do is I would just use the reference of this, and then within the AutoCAD Architecture environment create the factory, and also place the assets. Now, again to save time, I've already got some assets placed here. There are some checkouts. There's a forklift there. And also these thick polylines.

So these thick polylines are actually not thick polylines are custom racking systems that I created as chain assets. Again, instead of me manually placing one rack every time, I have used a really smart tool inside Factory Design Suite where all I had to do was create a rack,

and then convert that into a chain of racks. Now, you could do that with your conveyors, if your company designs conveyors, and so on. You could create your custom conveyors, and convert them into chain assets.

How do we do that? For that there's a really smart tool available inside Factory Design Suite called Factory Warehouse. Unfortunately, not too many people really know about this Factory Warehouse. But it is a fantastic tool. What it does is you can create your individual sections, and then use this factory asset warehouse tool to convert your individual sections into chain assets. A really easy simple process gives us step by step process of how to do it. You click on this build chain assets, go in here, and it shows you what you need to do. So upload translate, and publish three simple steps. As I said, unfortunately not too many people know about this. But if you do things like conveyors and racking systems, and so on, eve safety fences, and so on, I would strongly recommend you guys have a look at this.

So that's what I did. I use this bit here to create my own chain assets. All I now do is just specify the location of where I want to start, so let's say over here, just like what I showed you earlier in the conveyor systems. And I clicked over here, let's say 4,500, Enter. And it places this thick polyline. So in this AutoCAD environment it looks like I'm placing the thick polyline. But the fact is it's not really a thick polyline. Again to-- let me just save this file. To save time I already have this done. So if I go into store layout I've already got this store layout completed, where I've already synced this. Because I've got so many racks here it takes a bit of time. That's why I had to create it beforehand. But by syncing, what it does is convert all those thick polylines into proper racks. All I've done in here is gone and deleted some of them that were interfering with the door, or blocking the door.

So all I did, as I said, was created one of these racks, and then used that factory as a warehouse to convert them into chain racks. So you could do it with your conveyors. You could do it with your racks. We are actually also testing it with a company that designs the layouts for shows, and so on, where they want to put certain wall types. So we created a particular wall type for them, and converted them into chain assets. So when we placed those chain walls, when we sync to Inventor it converts them into proper wall types that they want, with whatever design that they need. So really, really handy tool for that, as well.

So within a few minutes we have created this entire warehouse. And then all I had to do was take this into Navisworks. So let me do a sync and render first. So what this does is, as you

could see, convert those thick polylines into proper display of these racking systems. And then now I can take this into Navisworks. If I go into open, I'll open the DWG file, and because the DWG file has got link and render file, it then opens the link and render file, as well. Might just spin it around. And then go-- let's hide the wall for a second, and the roof.

All right, so now this is my general arrangement of the warehouse with my racking system, the walls. And also to show off a bit, I've placed some of the checkouts, and this thing, as well. Let me just spin the room around. Let's zoom in here. All right. I might just-- Yep. OK. I'll start the walkthrough. Turn on the display, off the avatar, turn the gravity. So let me change this to horizon so it's a better display. So as you could see, starting from AutoCAD Architecture, within no time I just placed my chain assets, synced to Inventor, brought everything into Navisworks, and I've got my digital warehouse available in front of me. And because it's inside now it works, I can create all these different viewpoints. I can go and do a walk around this. So let me see if this viewpoint here-- I'll call this as overview. And then I can now do a proper walk in to my factory.

Now before I send it to the client I can also run the clashes to make sure that there's nothing clashing in my warehouse. There's nothing more embarrassing than things clashing. So I might go back in here. Let's turn off this. Yep. So I'll quickly run a clash test. Let's say, reassess this. Add test. I'm going to save this and this. Run tests, make sure that there are no clashes. Brilliant. So now that there are no clashes I can actually take this model, and use my A360 Drive, and send it to the sales guy, or directly to the client. They can open this on their tablet device, and then they can have a walk around. They can have a look at these objects. They can also do markups, if they require markups for any of these things.

So as I said, a process that took them about two weeks brought down to less than a day, just to get the general arrangement in front of them, and get the feedback. So without anybody risking a lot of time in getting the final design, let's get the general arrangement in front of the customer, make sure they're happy, and they can then approve this. Now, imagine if this goes with your Oculus. We are short of time. Otherwise, I would have put the Oculus on, but I might actually do it at the end anyway. So you can put your Oculus on. Immerse yourself in that environment. Have a walk. And get a realistic feel of how the things would look like. It's a totally different ballgame. You show that kind of concept to your customers they get blown away, and I guarantee you that the issues that you would normally have at a later stage, you wont have those issues. You can resolve those issues at the initial stage itself.

So I'm glad I was able to finish all the three things. The idea here was to put the Oculus on. But as I'm putting the Oculus on I'm ready for you to ask the questions. But before I do that, I have to ask another question for the book. All right. So my question for the book was, why was I able to see my custom folder inside AutoCAD Architecture? You know how I had my customer folder inside AutoCAD Architecture where I had my assets? Why was I able to see that inside AutoCAD Architecture?

AUDIENCE: Because you [INAUDIBLE].

DEEPAK MAINI: Exactly. Because I linked my project file to AutoCAD Architecture. You remember how inside AutoCAD Architecture I showed you, under Options, I could go and link my Inventor project file, and because those assets were sitting inside Inventor project file I could see them inside AutoCAD Architecture, as well? Congratulations. What's your name?

AUDIENCE: Christy.

DEEPAK MAINI: Christy. So with the books I also provide free access to videos. There's a email address that I've mentioned. I think, on page number five of the book. If you send me the email I'll create you a login and password for video access, as well. All right, I still have a few things to give away. 2X t-shirt, who's interested in 2X t-shirt? All right. Mark. And I've got a few Revu mouse pads. So whosoever uses Bluebeam Revu can take a mouse pad. And I've got a earphone as well. Who wants ear phone? See I'm so generous I'm giving you these things without even asking questions. You've got to thank me for that, right? Make sure you guys fill in the feed-- oh, good catch, man. Make sure you guys fill in the feedback form. That's really, really important. The feedback form will ensure that we can understand how we did, and also--

AUDIENCE: I have a question.

DEEPAK MAINI: Yes, please. So what I might do is I'll start putting the Oculus on, and if somebody wants to view the Oculus, and have a look, you're more than welcome. Yes, please?