CURT CHAN: My name is Curt Chan. I am one of the technical evangelists here at Autodesk. I spent a lot of time on the CNC side, background wise. I'm a mechanical engineer by trade. I spent a lot of time in the defense industry, so Northrop Grumman, Lockheed Martin. Biomedical as well, Abbot laboratories.

And then found my way to work for this really small company called SolidWorks. And then, went to another direct editing company called SpaceClaim for a couple of years. And found my way over to Autodesk. I spent a lot of time in the field as an application engineer, as well as using the products in mechanical engineering and design, and all that kind of great stuff.

My role here, when I came to Autodesk, was technical marketing. So if you guys know Lars Christianson, he's kind of the next guy in command that has take over a lot of the HSMWorks. And the inventor and him and myself work together hand in hand. And I spend primarily a lot of time on Fusion 360.

Today's agenda-- just to kind of go through-- is I like to really focus. If you sat in my lathe class, I had a guest speaker then, and I will have another guest speaker today in this class. I think it's really key for you guys to not just hear it from me, right. Because I can feed you a whole bunch of fluff, and lies, and butterflies and everything sounds all dandy. But I think it's best to hear it from a customer, right, and how they're using the product today.

But these are the three focuses I always have my classes is-- educate, collaborate, and CAM. And when we talk about educate, one thing I always like to ask the class is who uses a Mac, and who uses a PC? Who uses a Mac today primarily for work? So this round, it's like about 5% of the class. Last time-- yesterday, in my lathe, there was about 40% of the class that was using a Mac.

And the reason why I like to bring this up, is because what Fusion is about. Who here uses Fusion 360? So primarily everybody. And this is key, because, when I talked to students and I've worked in education realm for a number of years too, is that this product is dual platform. It's the first CAD and CAM platform built on a Mac. Natively, right.

And that's really key of technology wise, what we do, and where we can go with this product. Really key of-- I'll have presenters log into my PC, my Mac, and they just demo and then I'd log off and get into my own stuff. That's really key because when you come from traditional

CAD, or what we all are accustomed to, it's amazing how flexible this platform is.

And it really is the platform, right. If you have heard what we're talking about the future of making things, and you know how Fusion is now going to be considered a platform. It's really key to understand the direction we're going. So, where we are today with this package-- and I'm a pacer, sorry, so you might see my shadow here.

But the thing is-- we offer today two and a half access machining, three axis, three plus two and turning. This is great. We have a lot of people here in this room that are part of the development, are part of the Autodesk CAM team. So if there are any questions, I'm sure they will be able to do assist as well as we go through this presentation.

But this is just great to know, is this value right here is $300, right. When you look at the value-- even if you are a student it's free, even if you're an entrepreneur it's free. But for a corporate person that worked at Northrop Grumman, this is $300. For CAD/CAM simulation rendering. And I think that's really the key here of we have to offer. I'm not in sales, not trying to pitch you on why to buy it. But I think as you go through as users, you see what it is.

One thing I'm really key on is sharing knowledge, and aggregating all that knowledge. Cause, I get a lot of emails from people that say, hey where is this. And I'm like, it exists. It's just we need a place to where it all exists. And I'll send you guys this-- I created this PDF and you can see I have all these links already set up.

So if you say I want to learn basic training, you go basic training, it will filter through our deep dish website and take you straight to the basic training of CAM. Or just design, or anything like that. So this is really key. I push forums, because not only people like myself, but one of our senior developers, Renee, as well as our application engineers, we live on the forums to give feedback, right.

Because if I'm running around all week at AU, and you email me, and you don't hear back from me for another week, it's because I'm out on the road. That's just part of my job, and I'm not trying to ignore you. It's just-- I think if you want a faster response within a couple of hours, the forums is really the bread and butter.

So I'm not trying to just push you away, it's just I want to give you the right resources. And please use it, because it's a lot of great content on that. So when we talk about collaborate and collaborations, I find this key-- and this is the part I enjoy the most about my job, is the

collaboration part. I get to work with the real cool customers out there and hear their stories.

We're gonna have Jeff Hooper, owner of Backhand Bikes, talking a little bit before I go into the presentation of clicks and picks. But we are very, very active with Fusion as you can see, kind of Instagram, YouTube, Twitter-- all that kind of great stuff, right. Stuff that never existed five years ago.

And we are all about-- if you go to our customer page, you can see a lot of the great stories we like to hear about our customers. And the reason why I put this here is because we're looking for more, and we want to hear more about the customers. We want to hear your voice.

So if you are using Fusion today and you're doing something cool. Reach out to us. We would love to sit down. You can do a white paper do, a video. Help you market yourself as well. So definitely keep this in mind. With his next generation, I call it, right. You feel old when you say that term.

This next generation is all about social media and YouTube. And everybody today, I think, we all know that when we have to look something up, the first thing we go to is Google and YouTube to find out about something. And this is really key, because this is how we can learn a lot about our content. We have over I got like 500 videos on YouTube.

I've created a lot. My colleagues have created a lot. So use it as great resources that are out there that please leverage. A lot of questions I get, I've already created a video on. I just send them a link to the YouTube video, that they never knew that even existed out there.

Not that I'm trying to push you away, it's just the content's there. And that's why I created an aggregated pick page of all the data that's out there. So CAM-- and this is where we're going to start diving in. And I have about 8 to 10 different vignettes. And we could Stump the Chump, and all that kind of good stuff. I don't know-- we got people back here that will know it.

We are still developing the product. I just-- not when I say develop, it's not like we still got a long way to go. But there's things that we know that we need to iron out. I'm not gonna lie to you. I sat in a great round table on CAM earlier this morning. And there's a lot of things that our customers, who use it on a day to day activity, tell us that we really need to fix.

And it's good to hear that. So we're all about constructive criticism, right. You gotta remember, is this is based on the HSMWorks platform, right. That came from SolidWorks, that came over to Inventor. And now it's for Fusion, so it's going to make its way. Just be patient with it.

Nice thing is that, every six to eight weeks, we do updates, and that's nice. So you're always going to get that. So speaking of CAM, today's goal. OK, this is why you're here for the next 45 minutes or so-- is I'm going to talk about a whole bunch of stuff.

Everything from compare edit to tips and tricks, to some of the new things that just came out. To engraving, to patterns, to component patterns-- things that have finally made their way over to Fusion from HSMWorks. As well as-- I've gotten approval from customers on parts that I can share with you guys, that I work with a lot of job shops too.

And I'll walk in there, and they'll just give me 10 parts, and say let's program these parts. And you'll sit there and try to figure out why is this strategy not pencilling this wall? Is it because the geometry is bad? All these little things you've got to think about when you're trying to program a part.

One question I do have for you guys too, is, who uses Fusion to import-- if you're using CAM-- who is importing a lot of existing geometry diffusion? OK, so not that many people. So, are all you guys really designing from scratch, and then machining, if that's kind of intent? Yeah? OK.

That's great. So when you look at a job shop, for example, they're getting part from all different areas. And the beauty about Fusion is the interoperability, right. You could open up any type of CAD file-- CATIA, SolidWorks, PTC, and you don't pay extra for any of those translators. And that's really key. But it's great to hear that people are designing as well as fabricating with Fusion.

So this is kind of the genre of I'm gonna go down, and I got some cool things that I'll show. But one big thing now is-- before we dive in, I'll bring Jeff up on here. So you can hear it from the customer-- is we have a lot of things going on. And we had a lot of things on, right. Cause today's the last day.

So, what we have is the voice of the customer. I think this goes til 6:00 PM, which is actually really cool. I guess-- I didn't know you get paid to do this. So you can make $25 in half an hour to just go ask some questions, or something like that, someone told me.

So $25 is a fair amount of money, for 30 minutes of your time to learn some knowledge and ask questions of Fusion experts. Would definitely take a look at that. We also have the office hours, and of course we have been going out tonight as well as the main stage. So with that

said, I'm going to go to dive in.

And I like to bring Jeff up to the stage. Jeff, do you mind coming up? I would like to introduce Jeff. He is the owner of Backhand Bikes. If you haven't met him, or seen him roll round on his BMX bike, he-- Jeff he was one of the early stage users of, we used to call it Cam 360. And then it got it all together as Fusion 360. And he started then beta testing it out.

A long time into HSMWorks customer. And started doing some really cool things. I find this is where you're going to really understand how you can-- where the rubber meets the road at the end of the day. Of how a user, has praises, or constructive criticisms about our product. And have actually created a product to make tangible money here, rather than just as a tinkerer, right.

I think that's really key here, cause we're here to make money with the products we design. So, Jeff I will hand it over to you. I'm going to go and fire your video up that you so nicely gave to me. And we'll roll with that. And feel free to share. I mean, it'll be great to hear exactly-- your bike, you want to show it around. We can have people come up and take a look at it afterward. But go for it.

JEFF HOOPER: OK, my name's Jeff. I work at-- my day job is working for a company called Mueller. And what they do, is they design and manufacture anything that has to do with water infrastructure. And they're even getting into some smart water technology.

But when I go home, then I get to play with the exact same software that I'm using it at Mueller, and design and create my own products. And I have a little-- pretty good sized CSI machine in my garage. It upsets my wife just a little bit that she lost her parking spot to a machine. But I have a lot of background a machine there's no way of getting around it with my dad teaching and owning machine shops while I was growing up.

So I was exposed to all different kinds of software. I worked in the aerospace industry, programming in designing in CAITA, 5 axis. Also, using HSMWorks, and X Mastercam, GibbsCAM. I worked for GibbsCAM for a little while, helping them with on site training and tech support. But when I saw Fusion, I really liked it.

Mainly, because it was on the Mac platform, and I was starting a company. And I knew I was going to be building websites, and I was going to be putting together renders. And I would need to push them out, somehow, through videos of social media or on a website. And try to

get some feedback whether the customer would even like what I'm designing, or even be interested in purchasing it.

And so being able to do a lifelike render, that photo realistic render, gave me I could gauge on-- do I need to pursue this product? Do I need to make changes? And here is an example of something that I thought was really interesting-- and another reason I really liked Fusion-- is because I had that capability of doing a T-Spline model. So I took the T-Spline and then I pushed it into like a more parametric style modeling, where I could use it for a functional purpose.

As you see on the BMX bike here, and up here on the video. I came up with a way where I could make fast changes by making this little cut out. So I could combine those. And then say, I want to cut away that material, so I can go back and forth and make design changes with the T-Spline model. Because you don't want you don't have to recut all those holes and do all that stuff all the time.

Another nice thing about Fusion is that it kept my tool path. And everything I'm using to manufacture that product associated, so then I didn't have to worry about reassociating all that tool path or moving into another program and completely starting back over. So Fusion has been instrumental in being able to develop new products, and go straight to the machine. And make really fast, rapid changes.

I mean some of the design changes I made were while the part was on the machine. And I could actually change design, tweak. Maybe I had some tolerances that weren't meshing right. I could actually change the size of the geometry, push it back out to the machine in just a couple of minutes. So that kind of functionality is, I think, it's really important.

Especially in the prototyping stage. Whenever you're prototyping, it's a constant conversation. Opposed to when you go into production, when the conversation really gets disconnected. It's just a following procedures at that point. So I'm a big fan of Fusion , and I know that you guys will be too. And if you have any questions, I'd love to hear them, either now or later. So.

CURT CHAN: Any questions at all for Jeff? We can always after, we'll have some time for more questions. And you can actually take a look at his bike up here. He brought it in. He's based out of Chattanooga, Tennessee. And it's amazing, you look at the-- what amazes me, the surface finish, right. You look at-- I don't know what you did. If this is just straight up the machine?

So, it's amazing. And hopefully you guys can tell what it is, right. A company named Backhand Bikes. Fists. [INAUDIBLE] So it's pretty cool to see how he's really used Fusion 360, as a whole. I know we're focusing more on the CAM section, but I think we all kind of get the picture that Fusion is just more than CAM. Right?

It does simulation, rendering, modeling, direct editing, all that kind of good stuff. So with that said, we'll just dive right in. I'll show you guys some good stuff for the next half an hour or so. Dependant on time. Yeah, got some good time here.

So, the first one is, if you guys have seen this yet-- Tormach. We have a great partnership with Tormach to where every Tormach-- anybody that purchases it, gets Fusion for free for year. And this is their [? Arduino ?] board that they taught in their class. I actually got it from them.

I said, well-- I was working with one of our application engineers, Matt Nichols. And he created this really cool app, or this plug-in, to where it will create the step over jaws and the stock for you, based on just a set of parameters you put it. And where you can actually find this-- if you actually go to the Fusion 360 app site, right here you have something called Soft Jaw and Stock Block Creation.

So definitely take a look at this. Download it for free. And what this actually does is, you have to be on the modeling side And if I drop that under create it, add this little guy called soft jaw creation. And in here, what it does is it gives me a set of parameters. I could say, well, what's the jaw length? I'm going go with let's say on the [? top ?] markets is what? Five.

Then I'll key in what's the width of it. I'll go one. And then height is two. And what's the groove width for the step, right? I'll maybe go with 200,000 as well as 200,000. And then now, what's the box width of my stock?

And the reason why I like to use this, is because personally, I will not just put in numbers for my stock when I machine. I'll just go to the scrap yard, or whatever that we have a pair of nine of. There's a block there. I'll just measure it. Know those dimensions, and throw it here.

And I could say, machine from the model, or the multi body I designed. Rather than trying to figure out-- well I'm trying to machine a case for this, so let me offset stock by thousand all the around. That's unrealistic, right. I'm going to go grab something and measure it, and that's gonna be my stock.

So with this now, for the box width, let's go with, I think this is like under three inches. So I'll go with three inches, we'll probably rough it out. Then for a length of 4, I think it's like 3.8, and a height of 1. And all I have to do now-- so it does it for box as well for a cylinder. Which is nice.

If you want to do cylindrical parts, it'll create that for you. So now all I gotta do is say, OK. And it'll go on and create it for me. Just like that. So the cool thing about this, is that it gives you the history. If you are in the base feature down here-- not the base feature, the timeline in itself.

Now I have a whole bunch of give-aways that I don't want to take on the plane with me. So, I'll definitely ask some questions during this. So, how do I activate-- if you sat in any classes this week-- how do I activate the timeline if I imported a file?

Because when I import a file, I don't have the timeline at all. I want to turn on the timeline. How do I do that? I got an awesome decimal chart and an Autodesk CAM shirt for that person. Come on people. Didn't you guys attend any classes? Yes, sir.

AUDIENCE: [INAUDIBLE].

CURT CHAN: Yes, indeed. Yep, so right here when you right click on the file name at the very bottom, it says-- well I'm not going to turn this off, because it says do not capture. But you always want to turn that-- have that on, or flip that on. Here's a large for you, boss, and a decimal shirt-- chart, which is great.

So, the key here, that's something I've talked to the team about is, it'd be nice to have an option to have it on by default. Or have it on like a checkbox. Because sometimes I've gone through it. I'm going to show you the Tormach vice. One guy was asking me, how do you set up those vices, and have it all work perfectly fine? Oh, I'll show you how it to do it.

I went through the entire thing. You can download it from Tormach's website. I set it all up, and I didn't have any history. I'm like, damnit. I got to go back, and redo it, turn on the history, so I have all my snapshots set up if I want to make a joint chain, or something like that.

So really, really key is, if that's something that you would like to see always by default on, you put that on the forums. We have our idea station. That you can grade and say which ones you'd like to go into for next release. And they do a really good job of showing that.

So, if you notice though, see how perfectly this comes out. And if I come here, to now, I'm

going to take these bodies, OK, that I have. And I'm gonna turn them to components, to right click Components. And I'll right click on this component. Come down to Opacity control. We can just take a look at this guy. OK.

And this is really key-- these are all the things I hope you guys can pick up in today's class-- is, what do you notice about the positioning of my [? Arduino ?] case? And how the stock was created, as well as the soft jaw, or the step jaws, were created around it? You notice how it's gonna be two ops right? And how [? slip ?] because I'm going to flip it and I'm going to face the other side, right.

Now, no one asked me about the origin. This is where everything is based off. So when you design, OK, so I'll just do a basic design here. And if I create a box, OK, and I have the origin on, what do you notice?

Where is the jaws? Where we did everything sit now? If I actually create-- this is the part I'm going to machine. If I use this app to create the stock in the step, what's going to happen? Exactly.

So, what you have to do to take in consideration is, what I did in this example here-- is in my model, OK. I'll turn on the origin. I did an offset of the part off the origin, so I can have enough stock to say, this is how much is going to be here. So what I now do the second opp, I can now just face that part. And it's going to be exactly how I would have it positioned when I throw it inside my vice. Something to keep in mind when you use this app-- I've talked to Matt about it-- I gave him like a whole bunch of things, again, man, I know. But at least this is a start. To where you can quickly-- and the reason why I like to use this app, is because when you actually do a simulation of this, you can pick these jaws as for the fixture.

So you can see with the collision and a red flag, that kind of good stuff. This is the reason why I like to show this. Because sometimes people just program it, and they don't know physically how it's going to fit within the machine. And next thing you know, they crashed a tool and there goes $100, right. So, this is something really important to keep in mind when you use just this app.

So keep in mind, going from the app store, go in and download that app. I'm not trying to push it, but it's helped me a lot in just doing some basic stuff. The next one is-- this was actually a really cool customer part but I got, that they're called-- they're a machine shop based out of Tucson, Arizona. And they make all these really cool parts.

Now, they-- since they're job [INAUDIBLE], they import a lot of files. Can anybody tell me what's wrong with this file? Or is there anything wrong with it? And you'll get a fantastic Autodesk shirt, as well as a decimal chart. Can I machine this part? That's question number one. Yes.

AUDIENCE: [INAUDIBLE].

CURT CHAN: That is a very good point. So, you can actually machine bodies. OK. But that is A for effort though. You can still get this, cause I have so many of them. Thank you. Anybody else? You know the answer, Jeff.

JEFF HOOPER: [INAUDIBLE] want to go over with.

CURT CHAN: Go for it.

AUDIENCE: Those are surface increments. [INAUDIBLE].

CURT CHAN: How do you know it's surfaces though?

AUDIENCE: Because the color of the material next to the [INAUDIBLE].

CURT CHAN: Perfect. So, I'm going to go and give you the shirt, cause you already got the chart. So, the first thing they told me was, man, I programmed this part and it was acting all weird when I select faces. And right away, when I looked at it, I knew it was all surfaces. And the reason how you can tell this, is if you end the model side, when you go to Bodies, you see something called Unstitched surfaces.

And you have all these surfaces here. So, how do we repair ? bad geometry? And this is a really key part. One thing I loved about Fusion is, when I get models from customers, I can just repair them really quickly and then move to that next level. So all it is, is under Model, you come down to Patch. And from Patch now-- I just close this guy up-- come under Modify, say Stitch.

Windows select everything I have-- 28 selected-- say OK. And now it fully healed this part. Now I have one body to go ahead and machine. So really key when you walk through this process here. Any questions on that? Cool.

Now, next part, I have a couple of things I'm going to show you on this. Learned some new

stuff today too. Picking it up from-- and this guy is just a color thing, right. But it's still one body. All it is, I got to drag the color over on that face. But anyhow.

So, if I hop over to CAM now, let's talk about something. I love this part, because it's really cool. We So we have a couple-- we have two ops here. We had the front side and the back side. Two and a half axis. You could do it as three axis but we'll do two and a half axis on this one.

Now I'm going to concentrate on this side, OK. And what I want to do is, I want to first-- I would probably face it, right. Then come in and see that-- kind of have that step down and I have the inside face right there that I want to machine. This is probably the number one thing I hear of people that have trouble in regards to selections inside of Fusion.

Now one, you want to make sure you're always in the active set up. That's key. Because I have multiple setups here, and if I look at all them, I have this guy. If I click on my little AU one-- if that's active-- if I click on this top one, that's now the active set up. So anything new I put in will go to this set up.

You also will notice, too, is that I have things I need to regenerate. So, what we added recently is our hot keys for CAM. So if I do control-- or Command G-- it will go through, and regenerate. There we go. Regenerate all my tool paths.

So this is really cool because they will go through all the operations, rather than me select each one and then right click and regenerate. I can do Command G and it will go through all my operations to regenerate. It's a really quick. I know with mouse clicks and clicking-- Tim Paul, he's one of the AEs-- he talks, he's a machinist by trade and I'm an engineer by trade.

So when we talk about it, as an engineer, it's all about clicks. Because you wanna look busy, so you're clicking away. With him, he wants to keep the minimal amount of clicks when he's machining, because he needs to go get that part programmed, and get it out there and hand it to the customer.

So it's really cool to think about from a machinist's standpoint of how fast we can do it. And we'll talk about templates in a second, of how valuable this is. But I want to talk about machining this open pocket. So first, I'm going to come down 2D, go to Face. And I'm going to go in and pick a face mill.

And you can see that by default we have our filters turned on. I can turn these off. It

recognizes the face operation that I picked. So it filtered out for all my face mills. Have them all here. I go ahead and select that. One thing that's key earlier, that we've talked about, is something called-- in some other classes-- something called use chip thinning.

So instead of the tool coming in and just ramming right into the stock, and cutting with your inserts-- it's going to come to roll on it to give you some nice chips with that. So that's something that, personally, I would just have on all the time, right. That's just me. So I'm going to turn that on. You can kind of see how that rolls on in from here.

Now, let's talk about adaptive clearing this section out, OK. So if I come down to 2D. Come down 2D Adaptive Clearing, I'm going to go ahead and pick a tool. Go to Select. Filters out all of my flat end mills Let's just go with this guy for demonstration purposes.

And come over here to the Geometry tab. Right away, me as an engineer, not being a machinist by trade-- if I say I want a machine that face, I would think I could just come in, select this face and it would tell me to machine this face. But, it doesn't. OK. Go give us some things to think. Why does it do that? Can anyone tell me why?

AUDIENCE: [INAUDIBLE] the outside first.

CURT CHAN: I'm sorry.

AUDIENCE: [INAUDIBLE].

CURT CHAN: I definitely could. Definitely could. But now the thing though, that my previous op, I already machined everything on the outside. So I flip this over, cause remember, this is op two. A great, great catch, though. So why wouldn't do it?

You look at what I selected, too, right. Because remember I'm going to machine that face, and it didn't really select when you look at everything, right. I mean you look at what it's trying to do. It's not recognizing-- even from a selection point. If I go back and select-- remember I'm just selecting this face. I still have all these holes here, right.

So something to keep in mind, is there's something called stock contours OK. And what this does, it allows me to say, keep within this boundary, right-- which I already machined in my first op. But, from my pocket selections, what this allows me to do, it says I'm going to pick the things that I don't want to machine, OK.

Take the things that I don't want a machine. So I'm not going to machine that. I'm not going to machine that. And I'm not going to machine that.

Now, if I click on any one of these, like this. And I flip these arrows inside-- see how it's only going to machine those circles. So another tip is-- these arrows flip the direction of what's going on. If I say OK, it will now machine that specific area that we're looking at. The blue area.

Now, let's look at the machining time here. If I right click on it, come down, you know that we can go to machining time. And this one, depending on the feed scale-- your rapid feed. Right, this all adjusts if I just put some numbers in here. And tool change time-- we're not changing any tools.

This takes 2 minutes and 20 seconds. That's great, right? So if I simulate this-- go through, let's take a look at this tool path here. If I just right click, I can come over here to simulate. If we look at it-- take a look at it on this arena here.

So go ahead and turn the stock. Right. And it's going to rough all that stuff out since you turned off the stock. Make it transparent. So it's coming out, coming in, right.

So what the guy asked me was, I don't want it to come out and have my tool come in, and come like that. I want it to start in the middle. He looks in, and then work its way out. OK.

That took me a lot of time figure out, let me tell you. So, I'm going to show you how to do it. Because, it's just dependant on the machine, right. Everybody has their way they want to machine. And that's totally cool.

So, the thing to keep in mind here is, under Adaptive, what we're going to do, is right click. Remember what did we talk about the machining time here? If I right click, go to Machining Time-- it's about 00:02:20, OK.

So if I came here, right clicked on, and edited it-- come over here to the Linking tab, OK. And on Linking, what I can do is say, instead of ramp, which is helix, cause it will helical in, I'm going to say, let me do pre-drill.

And say, for my pre-drill position, I'm going to pick the center here. So it can come right down, as a reference. Say OK. So it's going to start now, come in, helix out, and then machine that way.

So these are some ways to think about where you can save-- you where you want it to start. You can even do from points, right. You saw from this area here, under Edit, I can machine from entry positions. So I can pick at different areas to do this, too.

So what has that done to machining time, right? So if I right click on to the Adaptive, go to Machining Time, it's now a minute and 46 seconds. So you look that if I have to create 1,000 parts, or whatever it is, their job shop.

They're not creating that many, but these are the tips that can help you be more efficient and cutting down on your machining time at the end of the day. Any questions? Yes, sir.

AUDIENCE: [INAUDIBLE] the 3D adaptive [INAUDIBLE] set that face?

CURT CHAN: Yup, you could do that too. And the thing, is I tried it as a 2D adaptive, as well as 2D pocket. And with 2D pocket, I can't do the prove to the pre-drill position. So it had to be done as adaptive.

So, I've noticed that just within different operations of the CAM package, is that there's little twerks that I think eventually it all kind of work its way across. But efficiency wise of doing exactly what they want, and I had to do it as a 2D, 2D adaptive clearing package. Great questions.

So, the other thing now is that if I'm now adaptive clearing that, I now need to do a finishing strategy, right. This is where the 2D pocket come into play. And I could care less about entry position, because I just want to finish it.

And one thing I love is that when I was working with HSMWorks works, two and a half was free, and then you pay for three axis. And now with three axis, comes with it. I always tell the customers, dude use three axis machining.

And one strategy that I use all the time is something called-- I don't know if anybody else has tried it-- but horizontal. And what it does, is it automatically will look at all the faces, the horizontal faces, and do finishing pass on all the horizontal faces. One thing I do want to show you though, is if I just say OK, right. What's the problem here? It's not a problem, but it's really a problem. Yes, sir.

AUDIENCE: [INAUDIBLE].

CURT CHAN: Exactly. Did you want one of these? So this is key, right. And one thing I've heard-- this came earlier-- was, will this now cost me time, because I have to do more clicks to go fix this problem at the end of the day. So how do we fix this?

Any idea on how we could fix this problem? If we already machined that face, how do we fix this problem where we only wanted to machine just the inside area? Get a new chart and a shirt. Yes, sir.

AUDIENCE: Use the select surface to [INAUDIBLE].

CURT CHAN: Under horizontal we can't do the avoid touch surfaces, yeah. Sorry. It's worth it.

Any other idea? Hans, man, you know all answers. Anybody else? Non-Autodesk.

Any guess. Someone give me a guess. How about that?

AUDIENCE: Can you just delete the [INAUDIBLE]?

CURT CHAN: You can't, unfortunately. Because you notice, I didn't select anything. So that's kind of the tricky part. I'm going to give you one of these too. So you can't select anything. Well, you can, but you don't want to.

The whole advantage here is to have it automatically we do, just like adaptive clearing right. You just want to gut it out, and move on your way. So here's the key here, is that if I come down and Edit the horizontal strategy-- come over here to heights.

I can say for this top height, instead of the top of the stock, that's why it's looking at it, right-- cause it's looking at the top of the stock. Don't look at top of the stock, look at the model top, which is still going to face it. But I want it to go down, maybe a thousand, OK.

So when I say OK, it's now going to not look at that and only look at everything a thousand below the model top here. Does that makes sense, regards to how that works? Now this is key, OK.

This is where templates come in to play. Because as a machinist, one thing I've learned from that whole team over there is efficiency, right. So let's say I get all this stuff dialed in feeds and speeds, step over, offsets, heights, all that kind of great stuff. Because all I'm saying is stock top offset down.

Not like I'm picking faces, I'm just saying, stock top. If it was a selection, it would be a little bit different. Cause I can say, let me pick this space, and then now offset down, so that's attached to the face. But I'm just saying stock top, I mean model top.

So what templates do-- this is really key-- is if I select both of these guys of the face and the horizontal. Because I know every time I'm going to machine a part, I'm always going to face it. And I'm always going to look at every single flat face and just finish it off, right.

I can save this, and get all this dialed in. The chip thinning and all that great stuff, right. Click and say, store as template, call this face underscore horizontal. Right.

And then, now, I can come back to any operation that I choose and say create from template, and go grab that one that's already dialed in. And it automatically will apply to that set up for me. So that's one click, rather than doing 15 clicks, right.

What's cool is that Tim, bring them up and these guys over here that they have a click monitor. And it will capture all the clicks, and he'll do as templates, and he'll do it is a standard way. And this really shows you how much more efficient you could be in programming your part, right.

We're all not machining experts, but I think it's great to hear from the experts. Like these guys, that can tell us, this is the advantage of why we put the stuff in from HSMWorks works. So I at least wanted to point that out, too.

Also, just kind of high level stuff-- if I go in and edit this adaptive, and I came down to passes. And I have multiple depths, and I right click, you can now do reset to the built-in default. Reset to your default. Make this a default, as well as edit the expression, which gives you now an expression of-- OK, this is how we're finding the calculation and now you could put in your own thing.

And if you took Nick's class earlier on Inventor from HSM, he really went onto depth about all these little presets. Definitely take a look as his recording from Tuesday, I believe.

So that's--

AUDIENCE: [INAUDIBLE] catching the tool, [INAUDIBLE].

CURT CHAN: --everything. Yeah, tool path. Everything that's how you set up in that operation is captured. So you can go and change the tool. Yep, so when you talk about material, you're going to

adjust your tools depending on the type of material you're cutting with.

And, I know that some of the guys can talk about-- we've had comments come up about, what's this all about here for materials. What's this whole goal here. If I pick aluminum-- I mean, I can set up tools that can filter out that I would cut with aluminum.

I think down the road, and correct me if I'm wrong, is-- our goal would be to where we have a list of materials. Or you can create your own custom materials. And as you pick the material you work with, it filters out everything from your libraries and has only those tools to show you. The ones that you work with specific materials.

So everything will become really, really intelligent. And that's the long term goal as we evolve into a library. This tool library is about a year old. It used to be based off of the HSMWorks library. And then we specifically revamped it for Fusion, so we could start doing cloud libraries.

I mean, at first it's-- for a fact, change is difficult for everybody, right. Someone coming from Inventor 8 to HSM to Fusion and trying the library, it's going to be a little bit more of a learning curve. But you look at how beautiful is it to automatically go to face, and it filters out all my tools for me out of every single library.

It's really nice when you get in to some of those things.

AUDIENCE: [INAUDIBLE].

CURT CHAN: Yup, you could adjust all your speeds and feeds.

AUDIENCE: [INAUDIBLE].

CURT CHAN: Correct.

AUDIENCE: You can [INAUDIBLE].

CURT CHAN: Oh yeah, totally. You can even create your own custom tools and all that great stuff. There's also the-- if you guys sat in [? Al ?] [? Waltman's ?] class earlier yesterday, they introduced the helical tool.

Calculator, I guess. Something like that. And it's really cool to where-- of course, nothing works with their tools, right. But it's cool, because you can now say well this is the type of material and working with. This is my spindle speed. This, this and this.

And it will say, oh, these are the tools we recommend. And now, here you go. So it's a great-- it's free. So go ahead and download it, and take a look at it. So, I just want to show you guys that on this part.

The next piece I had was-- this is just basic, right. One thing that comes up, that people love to work with woods, and other types of just 2D pieces that you want to add taps to-- your water jet, right.

If you guys do any water jetting-- cause I have the water jet tab here as well-- is I want to add taps. And where do you do that? Number one. Anyone work with wood? Couple of y'all. Okay, cool. Couple of people.

So what you can do-- is under Model, drop down to CAM. I'm just going to say, create a new set up. And from here now, is-- I have a lot of stuff hidden here. Because notice this, if you look at my model, just going to show you.

Because I have all these parts hidden-- so that's why that box-- that boundary box looks really big. Cause there's hidden parts, you'd expect it just to be around just that visual piece. But what you've got to do is, when you do a new set up, come here to Model and disable this is the part I want to machine.

And it's going to put the stock based around that. If you have it modeled, you know how we did with the jaws and the stock, I come down to here say, from solid. And go pick that stock that I model to, say, this is what I want to base my stock off of, that I want to machine. But for this purpose, we'll just do it like this.

So, basically with contour, I just want to maybe pop this little PCB board out of the plastic that I machined it out of. So what I can do is add tabs, and tabs are found under-- aside from facing it and all that. I think you guys understand that. I can come down to 2D, go to 2D Contour.

And from here now, come over here to-- let me just go pick a tool. Let's just go with this guy. For example, for demonstration purposes. Come over here to Geometry, Contour selections. Pick this edge to go all the way around. If I flip the arrows, it's going show you everything on the inside. Which is not what I want.

So I want to pick the outside, or leave it as is, and turn on tabs. And with tabs now, gives me a pretty little preview. I could say, well, you know, what's the tab distance? Maybe one inch

apart. Do I want it to be a rectangle? Or triangular? And you know, there's my tabs.

That's it. Send it off. So, if you want to work with tabs, it's a great way. Really, really quick. It's found under 2D Contours. Next one I want to talk about is this guy. Let's talk about this guy.

So this was another part from a machine shop that at first you look it, your like, man, how in the heck do I program this part. And one-- A, do it as 5 axis or 3 plus 2 and just have it rotate around and do it all nice. Or B, if you don't have that type of equipment, you're going to do multiple setups.

And what I did was-- on this avenue, is how do I machine these guys right here. I know I'm probably going to come in, and machine this area. Number one. Number two-- anybody know what kind of tool I would use to machine this right here?

AUDIENCE: [INAUDIBLE].

CURT CHAN: Kind of heard it. Somebody said it.

AUDIENCE: [INAUDIBLE].

CURT CHAN: You could. Chamfer, right.

Cause we're looking at this-- this is a big ass chamfer, when you look at it. So if I measured from here to here, if I have a two inch diameter chamfer mill, I could probably do this. Or you can do a ball in, step down and then come up with the scallop. And that's one approach that I did do of taking that guy here.

So if I just kind of went through, opened up all my tool paths-- just do Command G. And it just regenerated every single one under every single set up. And I just, as it calculates, just roughed it out. Then did a contour all the way down. If I didn't have that chamfer in it all right. And go with a smaller tool for that little piece, but I get a chamfer mill for that , so.

The problem though, is-- well how does it ignore-- if you look. How did it ignore and not cut it into these areas right here. If I roughed it out, right. Cause I roughed it out, it should've ripped through down here. Because that's what adaptive does. It looks at everything, and says remove it.

So the trick-- and this is one way-- and the guys out here too can voice their opinion on it. So one thing I did, was under Model, is I created two bodies. So I just took one body, Control C,

Control V-- copy, paste. And now I have another one. And I'll turn off one of the bodies. And I defeatured it.

That's one beautiful thing about Fusion-- is a great defeaturing tool. So I said, I'm only going to maybe do an op of just that centerpiece, and then come in and do the rest of it. Drill the holes, and all that kind of good stuff. So, cool thing here is, if I want to defeature, if I actually select the whole and hit delete, it would just start deleting features for me.

So this is a great way-- and I'll just go through this really quick-- of how I can just really only concentrate on this operation. Then hide it, turn on the other one, and then finish it up. Because it's essentially going to be the same thing here. So I'm just going to go through, delete it. Just like that. You can see where I'm getting with this right.

How do I get rid of this guy here? Well it's just kind of the same approach, right. See what it's doing?

Not that, right. I want to do this. And now I have this that I can do as one set up here, and then come back. And then turn on this guy, do a new set up, and now finish it off. And that's the approach I took on machining this guy. Just like that. OK.

Hopefully that's of use to you guys. I think it's key, when you look at some of these parts and people-- I, myself, get overwhelmed. And I talk to these experts over here, saying, what do I need to do? Well, just break it down, right. Keep it simple. So you can go on and defeature items. And then from there, create new set ups.

If you're doing it as a three axis, or two and a half axis part, you're going to have to probably create two or three set ups. So take your time and do it correctly. Use the equipment that you do have. Yes, sir.

AUDIENCE: [INAUDIBLE] on the CAM side. And you have to be careful that [INAUDIBLE] correctly. [INAUDIBLE].

CURT CHAN: Correct.

AUDIENCE: When you switch to the other side, it's not going to be able to use [INAUDIBLE].

CURT CHAN: Not at all. Yeah, that's the nice thing, is that when you do do a new set up, is it just depends on the model you select. When you do a new set up, it's a new body. So you hide the one that

you don't want, go pick the one you do you want to machine and that's all this.

So it's just all selection based at the end of the day, which is cool. I saw another hand. Yes, sir.

AUDIENCE: [INAUDIBLE] body, just because when you select a face, it's selecting the--

CURT CHAN: Exactly.

AUDIENCE: So, there's no way you can deselect it so the boundary of the edge--

CURT CHAN: Well the biggest problem is this cut out here. So if I just said bound it only to this, it's going to loop around right here and not give you a really clean-- cause really I want to loop round that entire piece. So I can't have the geometry loop around here.

So if I heal this, do a patched surface, that surface is not looking pretty. It blends together all weird and I still can't get that entire loop. So what I do is-- that's why I specifically took this approach. Because it was just easy. I'm sure there's another way to do this, but I found that defeaturing this to get exactly what I want to machinee-- machine just that, hide that body, and then I'll pick it as a new set up was the fastest way to do it.

Yes, sir.

AUDIENCE: [INAUDIBLE] clearly to [INAUDIBLE] long holes [INAUDIBLE].

CURT CHAN: Yes.

AUDIENCE: [INAUDIBLE].

CURT CHAN: Exactly. Exactly. Because there's a void, like a void touch surface. You say, oh, just avoid this face. But it still doesn't do it. Even if I patched the surface, and I still say to do it, it doesn't come out the way we would think that-- all right, this is going to logically work. And it makes sense when you walk

Through. I don't want to spend the whole time doing it, but you-- trust me. I spent a lot of time doing this one. Yes, sir.

AUDIENCE: [INAUDIBLE]. Do you ever worry about when [INAUDIBLE] the problems [INAUDIBLE]?

CURT CHAN: Not at all. Since I don't have the history turned on here, doesn't even matter. And the nice thing, if I had the history turned on, then all the defeaturing that I had will be captured.

And I can just-- if I want to refeature it, I could just roll back the timeline and then have the history back, which is nice. So there's a couple different ways, for sure, you can skin the cat. Looking at the time.

I have a couple other ones that I want to dive into. Just really quick on-- where is this sucker at-- right here. So one guy was asking about this Tormach vice, and how things work. What I did was if you the joints class, then you learned how to just do this, which is awesome.

What you can also do, too, is set up different constraints to say, stay between 0 and 105 millimeters, to give it that sliding. That's how I have it stopping back and forth. But what one guy wanted to do was-- well I want to turn this, and then have this move with it, right, for some purpose that he wanted it. So, I said, all right.

Well, all have to do is come right here to Assembly joint, come down here Motion link, and say, what is the joints I want to work together. So, I want to take the revolve, as well as the slider. And that's it. Say OK. And now I can move this guy. And that will move with it.

And I can change the revolution, and all that kind of good stuff. So, just for the person that asked me that. Close this guy out. Talk about that last. So let's talk about this guy.

I like-- so, I'm not trying to push Tormach and tell you go buy the machines, but we just have a great partnership, as well as with Haas. And they gave me one of their parts. So, I said I, might as well demo it, because it works great with the new engraving tool we have. That's why I'm showing it to you.

What they did before is, you can actually use the trace operation to go around, and then trace this out. But there's a problem, right? Cause if you look at the geometry, it's really [INAUDIBLE] out, right. It's not like a pencil trace. Because if I simulate this, you're going to take a look at just the strategy here for stock. And let me not make it transparent.

So if I go through, let me turn it on wallpaper. It looks a little bit cleaner. So I'll stop it right here for a second. See what trace does? Is that, it's following a line. And since I selected both lines, it's still leaving the material in between. Which is fine in the next example I'm going to show you.

But for this example, what it is, we took that technology from HSMWorks. And we said, well now, if I have the trace, I'm too lazy to reselect all these contours. I can actually go through ,

right click on Trace. And the cool thing about this is-- if I come down here and say create a derived operation-- but I can apply it to another operation.

Meaning it will take the same tool, as well as all the contours I selected, and apply it to a new operation. Which is awesome. It saves me so much time. So I could come down here to Engrave. Great, have it all, ready to roll, say OK. And now it's going to engrave this guy.

And what engraving does, is we go in and simulate it, real quick turn on the stock and hit play. Based off the diameter of the tool, right. So if I have, let's say, a rectangle and then it gets-- as it goes through longer and longer, it's going to get shorter and shorter, right. So if I want to get to that end point, I'm using a chamfer end mill. OK.

Instead of it trying to go through and get to that shorter parts where that tool diameter cannot fit into, it's going to stop, right. And it's not going to machine any of the rest of it. So what engraving does-- it basically as it goes to the narrower part it's going to lift the tool up. Are we done now?

[INAUDIBLE]? That sucks. Oh, you know why?

Cause my battery wasn't-- I think I lost power. Let's take a look.

There we go. Perfect. [INAUDIBLE] expo, cost me $50.00.

Let's go to AU [INAUDIBLE] cool. So the point here, is basically as the area gets smaller, the too is going to lift up, so that the tip is going to go right in and then machine that area. So it adjusts all per the size of the piece you want to work with. It's really, really cool.

We've got some really cool YouTube videos, but you get what you want at the end of the day. Which is really nice. I at least wanted to point that out. Now, if you want to use trace, though, let me show you something else where you can use trace.

Is right here-- I have this question come up all the time. If I come down under-- I'm just going to go back over here go to Model. Anybody work with SVG files, or Adobe files? And people want to bring that in, and trace them around and machine them down to a depth. And there's always some tricks with them here.

So, if I go under Insert, insert SVG. Pick this face. Let me go select my SVG file. Let me go grab the fancy Fusion logo. We'll drop it right in. I'm going to just zoom out cause this logo is

pretty large. Cause I was too lazy to scale it. So I'm just going to grab the arc and I can scale it down to the relative size that I'm looking for, just like that.

There we go. OK. Now I can grab this guy, and we'll kind of place it, something like this-- goes something like this right here. OK. Say OK. And on my sketch.

So, here this is. Let's say I want that rotated 90 degrees. Does anybody know how to do it? Aside from Autodesk employees? [CHUCKLING] Right.

AUDIENCE: [INAUDIBLE].

CURT CHAN: You think you can, but you can't. So this is the part that got me. And I think I've let people know about it. And I think we're definitely going to get a better workflow.

But to give you guys a heads up on this, this is a struggle. I've done a lot of videos on working with these images. Projecting them on the faces and then machining it. But, if I wanted to come in here and just kind of pick this guy up-- right click and say move-- I can't. I can't.

See, that's the common sense way of doing it, right. So, this is the tricky part, right? So what I'm going to do, just to make our life easier, is I'm just going to turn off the body, OK. And I'm going to just draw a window around this guy and select it. Now, on the right, this is the key-- OK. My constraints.

It's weird, how it doesn't tell you, but see this little fixed/unfixed? If I uncheck that, now it's not fixed anymore. So what that means, is see how this turned to blue? Meaning it's under defined. Now I can physically come in here, select this guy, right click, say move, and it gives me the triad.

And now I can move the image. Right. So this right here is probably the value of the class, right. Took a long time, and I let them know, but always keep in mind when you work with the SVG file-- go over to that constraint dialog box. And it's the only one that showing that's not grayed out. It's fixed/unfixed.

So it's telling you something's up with this. So this is now where you can go and say, stop, sketch. Let me turn my body back on. I can now come back, go to CAM. And now use-- for let's say, I think this is the next op, right. So let me activate this op. Come here to 2D, Trace.

This is not the right tool, but I think you guys will get the picture here. Pick the pieces that I

want to machine. OK. Then come under the passes, change the axial offset down-- let's say by 10,000.

And now it's going machine down 10,000, and create that part, OK. Because it's tracing around a single line. So trace versus engraving is really key. Let's kill this one out. I know we're at 4 o'clock, so my apologies if people have to leave. All right.

So the last one I had, or two, was-- we talked about import-- so this is awesome. This is one thing I really liked about our latest release-- was component pattern. Coming from HSMWorks, it was great to now see. Doesn't matter, location wise, if my part is rotated 90 degrees, or flipped, or whatever.

It would take whatever pattern I have, I'm doing this on a tombstone, and throw it all on there. Rather than with our traditional pattern is, you got to go linear or circular, and everything has to be faced the right way to have it perfectly work, or machined.

With component pattern, if I go under CAM, really quick. And I'll get into just the 3 plus 2 last. Is if I just apply a set up-- course it's going to pick up everything. Come here to Model. Let's just pick this guy. And I'll just say, OK. Let's just do a quick adaptive clearing.

Select this bad boy-- oh, this is too short. Let's go with my L3 library. Let's just go with that. Then filter out-- nice thing, filters are phenomenal. So, there we go. Rough this guy out, OK. I can pocket, and all that kind of good stuff.

So the cool thing here-- let me actually do a pocket. I'm going to do a 2D pocket. And let's pick this guy, and this guy, say OK. Actually, it's too big. Let's do a smaller tool. Should have just had this guy set up for you guys already. So, my apologies.

Probably crash within it, cause I know it's too short. Yeah. Whatever. So just to show you, demonstration purposes is, if come over here to-- if I select both of these guys, come down to New pattern. Come right here to Component pattern. This is my source.

And it's automatically going to recognize all the other instances I have of pliable tool paths. Say OK. There it is. If I come in m and go back to Model. Double click on this guy, Control C, Control V-- copy, paste-- and move this guy off. Rotated it around. Have another instance of it. Drop down, come here to CAM.

Open this guy up, Control G to generate. Let it think for a little bit. There we go. So there's my

seed. Click on the pattern, it going to apply to all of them, which is really cool.

So if you're doing multiple ones of these-- like on a table, and their flipped, or nested, or whatever you want to do. It would just recognize all these components for you. And then lastly-- I know we're over time about three minutes, and we'll open up for some question-- is the 3 plus 2.

So whenever application engineer CJ made this part on a Haas UMC 750-- take you to the YouTube video. Kick ass. He just did it as 3 plus 2. That's all he did. And the cool thing about this, is how 3 plus 2 works. If I hop over to CAM, and if you look at the geometry that I want to machine here-- so if I say, set up and I'll do this part, OK.

I'm going to just flip-- I think we all know if I click the head of the arrow it flips the direction. Click the stem of the arrow on a face that I want to be normal to, it will fix it the way I want it to be. So ideally, just for demonstration purposes, I could come around and say, let me adaptive clear.

Let me just rough this bad boy out real, quick right. Let's go with 0.75, OK. It's like 30 seconds left, so please bear with me. Let's just rough this guy out, OK. Then now, let's say, I want to come and machine this pocket. So different direction of the work coordinate system.

So to activate the-- let's just do a little bit more. Make it a little fatter. Let's regenerate. So now if I want to do this side, right, different orientation. If I come over here and there's going to be a pocket, OK. Drop down, go to 2D pocket. See my orientation is wrong, and you got to machine this side.

So what you've got to do, is come over here to Geometry. Come down here to something called Tool orientation-- check that on. I can now say, well I want it to be in this direction to machine, so click the stem of the arrow and this face, and now that axis for z is going to be faced that way. Post up the code. She's going to rotate.

And then all I have to do now is say, well now for the pocket, is machine that one. And say OK. And now it's going to machine that. Changed my heights and that's it.

That's all 3 plus 2 is-- is changing per your operation, your tool orientation. That's how simple it is. So with that said, we're over. Thanks again.

Is there any questions at all before we finish off? Hope you guys learned something. Walked

away with something. Good. Cool.