

**STEPHEN PRESTON:** So my name is Stephen Preston. I work for the Forge Partner Development Team. We have a team whose job it is to help people like you be successful using the Forge APIs. Give technical support, write samples, blog posts, that kind of stuff. The other speakers we have today, I'll just ask them to introduce themselves. So Shawn, would you like to?

**SHAWN GILMOUR:** Hi. I'm Shawn Gilmour. I work on the product management team for Forge.

**DAVID GARTNER:** My name's David Gartner. I lead product marketing for Forge.

**BEN COCHRAN:** I'm Ben Cochran. [INAUDIBLE]

**STEPHEN PRESTON:** So basically, Ben's job is when we make a mistake he corrects us. That's his job. I did want to just set the stage for this presentation, because we talked about Forge quite a lot at AU. So first of all, how many people here are ADN partners? So for those of you, what we're covering today is pretty much the same as we showed on Monday, except in a more informal setting, obviously. But you know, if you feel that, oh, I don't want to see it a second time, don't be embarrassed about going, and finding another class. We'd like you to be here, but you know, you don't have to be. And then, Shawn, you presented some of this yesterday?

**SHAWN GILMOUR:** I presented some of this yesterday at the Enterprise Priority session yesterday.

**STEPHEN PRESTON:** OK. So there is some overlap with that, as well. Cause obviously, we're very keen to get good survey results. We don't you guys feel we've wasted your time. And you know, this class isn't about hands on coding. This is about possible [INAUDIBLE] road map, what we [INAUDIBLE] samples, just to give you some ideas to get your creative juices flowing. OK, so over to you, David.

**DAVID GARTNER:** Sure. Thanks. Can I just do quick level sets, so I know who's in the room? How many people here already have a good familiarity with the Forge platform? Understand what it can do? OK. And how many of you consider yourselves engineers? Designers? Coders? And how many of you consider yourself a marketer? OK. I'm a marketer. And that's the perspective that I come from with Forge. And I care as much about marketing as lot of you care about engineering, or design.

And that's why last week I was pretty excited-- let's see if it's actually forward-- when Autodesk came out with a new tagline. I get excited about taglines. And it's, "Make anything." And we're seeing a lot of that this week. 30 years we've been in business, and pretty much create tools that help people design, that pretty much built world around us. That's why we're here. But the world of making things is changing. That's something that you're seeing every day here. Especially part of that change, and a lot of that was in this morning's keynote that Omar gave, which is connectivity. That you can't be designing in a silo. You can't be working in a silo. Systems and people are all connected. And a lot of what's ended up happening is products themselves are connected, and every company is becoming a software company. And so the company, you can either get into that, or you can be your competitor, as well.

And one thing we've been noticing at Autodesk is we need to create tools that are connected. So we need to change ourselves. Again, you saw that this morning in Omar's keynote that Shotgun, BIM 360, actually, and Fusion, are all right now being built as cloud native products, connected products that are connecting your data to other pieces of data. So what we've also found though, with that sort of change is that not every company, and not every solution needs to be on our desktop software. So what Forge has done is taken the building blocks of each of those pieces of software, the APIs, the web services, and delivered them as easy accessible cloud services and APIs through Forge. So we're actually taking the tools that we're building, and making a lot of those components available to you to build your own solutions.

I just find that funny, because who knows what your solution is? It's kind of like when you were a kid and you had LEGOs, and you could take something from the frontier LEGOs. You could take something from the space LEGOs. You could put it together and create something new. And that's one of the beauties right now of Forge, and why we've created that platform, because as things change, and as things become more connected, and you want to be connecting with iOS sensors, and you want to be connecting with AR, and VR, and you want to be connecting with cloud services for rendering, and for analysis, you really actually need to have one platform that connects all of those pieces of data.

And data. You've heard it. It was interesting to sit there, to hear each of the components this morning. Everybody kept saying our data needs to be connected. Our data needs to be connected. Right now there's a lot of different systems that you're going to be interacting with, and a lot of different file formats that you're going to be connecting. Forge really is the glue between the two. And I know Shawn can give a lot of examples of those that he might give

later. But it's really, right now, creating one platform that can actually connect each of those pieces of data to deliver new solutions.

So really what's possible? That's one of the most interesting things I'm finding. I want all of you to sort of ask yourself that. That if your customers had access to the design data, that they didn't have to access it through a CAD system, that they could access it through a web browser, they could access it through a mobile device, anywhere in the world, what is actually possible when you're connecting, let's say CRM data, usage data, and construction management? Some examples of what that might look like.

Forgot to say, that's actually my new tagline for Forge is, "Use RESTFUL APIs and cloud services that integrate with your existing systems and connect design data with other data to make your own applications that can make anything." It might not work, so we'll just say, make your own applications to make anything. And that really is the core. When everyone says, you know, well, what's Forge? That's really what it is. It's allowing you to make your own applications to make anything, and to have your customers interact with data in whole new ways.

So Forge both is a platform. But we also have an investment fund. \$100 million fund to support innovations within Cloud computing, within Cloud companies doing innovative things with the Forge platform. I want to just briefly show you three examples of it, before we get into the meat, which is really what the APIs are, and some live code samples. But this will give you a sense really what's possible. The first is MakeTime. And MakeTime connects, through, excuse me, an online platform, designers with manufacturers. The way that Amara described it this morning, it's sort of like Air C&C. So what they're using basically is the back end for converting and connecting all of those different disparate parts into a central system to streamline the automation process, and also connect with other back end systems, to allow for billing, and design refinement.

3DR. 3DR's actually a really interesting example of a company that really had to be a software company. They make they make, right now, the drones. And any company can be a-- I can't say any company can be a drone company, but a drone company alone, you're just basically creating hardware. But what they've done is create a whole platform for their drones that connects the information that their drones are connecting to other BIM systems, and other design systems. So all of a sudden you can have real time rendering, and you can connect that data collection using our reality capture API to existing designs to see it in real time, or

connect to systems at the homebase.

Another example is Seebo. Seebo is an online system that connects IOT information with CAD design. This is a great example of the viewer that's allowing you to actually see, within your design, how to connect sensors, how to connect different IOT systems with the design, and as it modifies, it modifies in real time. So I'm going to pass it on to actually go into the meat of this, which is really the APIs, and the update.

**SHAWN  
GILMOUR:**

Thanks David. So I'm Shawn Gilmour. I'm the product manager for Forge. Ben introduced himself earlier as the architect for Forge. So Ben, I'm going to invite you, if I say anything that should be corrected, please feel free. I'm going to talk about a couple of things. First of all, I'm going to talk about some of the core APIs that are part of Forge today, just a high level of what you can do with some of those APIs.

I'll go a little bit into the roadmap, or some of the things we're working on for Forge. And then Stephen is going to come up and he's going to show you some of the sample apps we've created on Forge to kind of give you some ideas of what you can really do with some of the APIs I talked about, and I think a few customer examples, as well, of what some customers have actually done with the APIs. So little bit about talking about what they are, and then Stephen will show you some live examples here.

So the first one I want to talk about is what we call our Data Management API. This is a new API, since last year, when we announced Forge at AU. If you think about when you're trying to connect with information this is really the API that lets you do. That so we have several SaaS applications. You have BIM 360, BIM 360 Docs, Fusion Team. All these applications store data from our customers in them. And people want to be able to take that data, and either integrate it with other systems, or get access to that data to move it out.

So for example, if you're trying to put data in from Box or Dropbox, or take data out from one of our solutions and put it in Google Drive, you know, those are the kind of things you can do with the Data Management API. Or even if you want to get access to some of the data that's in the models that have been inside of our products. So if you've got Fusion Team, and you want to get out some of the build material data that gets created automatically when you upload a file into Fusion Team, you can use the Data Management API to go in and get access to that.

So it lets you browse your projects, create folders, go in and see versions of files, understand kind of what's going on. So it's sort of the basic idea. We recently added also searching and

filtering. So instead of looking through a whole list of projects, and getting a return for, you can say, hey, I'm looking for projects that start with this. Or I'm looking for folders and files that start with this. So it makes it a lot easier, and a lot more efficient.

So right now we've got our Team products APIs out. We've got a beta of our BIM 360 Docs API out. That one can read right now. And shortly, that will go to be able to write. So I would say, you know, by the time we are hitting our Christmas break, we should have a full compliment of all of the SaaS products covered in that API. Now, the important thing is it's one API that lets you get access to data in all of those products. So you don't have to write a different application to get access to the data in different Autodesk products. Coming soon after that, though we'll be doing things like being able to allow you to actually create projects in those products, or add users to projects in those products. So a little bit more management. So primary thing here is to be able to manage the data, and get access to the data inside of our SaaS applications.

Also, if you're not using our SaaS applications, but you want to use the services I'll talk about in a minute within Forge, usually you have to put data up into the Forge platform so you can operate on it. Well, if it's in the SaaS apps, it's already up in the cloud. You can already get access to it with any of the Forge APIs. But if it's not there yet, we also have a portion of the Data Management API that let you put your data up in the cloud, and then you can call, and get other services to go and access that. So for example, if you want to use our design automation API to go and modify a DWG file, or if you want to translate that file into a STL, or step file, for example, you can do that.

So we also have sort of two portions. One for the SaaS apps, and one for just getting data up in the cloud to operate on other web services. Just one thing to note here too is that access, or that API that you're using there, it's using the same base platform that we use for all the SaaS applications. So essentially, when you're accessing all of these things, you're taking the same path, and getting access the same way that our SaaS applications get access to that information.

The next one I want to talk about is another new API. Depending on if you had a little-- I know some of you had a little bit of a history with Forge. When we announced Forge at Au last year, we had sort of a combined service that was called The View and Data API. It was a combination of being able to upload data into the cloud, being able to translate it into a format for viewing, and getting access to metadata and thumbnails, and stuff, and then the viewer

itself to be able to go and access that information to be able to view it.

What we've done is we've separated those out, because we've added a bunch of new capabilities. So like I said, in the data management one, we added the ability to get access to data in our SaaS apps, or do integration with things like Box, and Dropbox, and things like that. In the translation one, we used to just only let you create files from those 65 or so CAD formats into our viewing format. But now we've added a lot more capability in there. You can create STL files, and step, files and IGES files. Or if you've got Revit files, you can create IFC files or DWG files from those.

If you look at the file list up on the web site, and I'll show you that in a minute, all of that, it will show you every format, and what format it could be converted to. So we've added a lot more capability there. So we've kind of separated out that, so you can use it separately from just creating viewable files. But obviously it will be able to convert anything 2D and 3D. It lets you create the different formats, and then also get access to the properties on that geometry.

And that's a key value there, because we have many people-- like when we talked about MakeTime, that David gave the example, or some of these other guys, they're not just trying to get access to the model, because you know, one of the key values of Forge is giving people access to design data in a browser, or mobile device, without the CAD system. But they're also trying to get access to that metadata that's in that model, and generate things like reports, and BOMs, and schedules.

If you were at the product innovation forum this morning, and you saw the Forge presentation, a lot of what J.E. Dunn was doing was not just the visual portion of it, but they were using all of the metadata to drive different processes within their company. So that part's just as important here. And you get access to that all through this same API. So metadata, thumbnails, 2D information, 3D information, all available through the same API.

The next thing we have is our viewer. Now, this one of the ones I talked about before. They're all REST APIs, so easy access, just straight REST calls. This one's actually a JavaScript API. So we have our viewer itself, but how you embed it in a web page, whatever experience you want to create, whether it's 2D or 3D, all of this is done in JavaScript. This is an example of a partner called simulationHub, and they've emulated a full simulation platform. So they do simulations in the cloud, and then use Forge to visualize. A lot of the visualizations they create they're just using JavaScript to be able to create those objects inside there, or they're using a

3GIS as well.

You know, from a visualizations perspective, that is just a straight view. That's not even a rendering of something inside of Forge. So the visualization side of this is very strong. Straight from 2D into really sort of high end visual looks in there. So you don't have to necessarily go to strict rendering, and be able to use that instead of Forge. Now, the other thing you might notice if I go sort of and look at these different things. Just look at the UI for these different examples that I gave. It's different in each example. There's different sort of UI experiences in here.

So we allow you to tailor the experience to the type of user. So when you get to this one, for example, all it has is four little buttons in the bottom. And that's it. Most of it is actually just operated by the mouse. So depending on the user you're trying to create an application for, cause that's really what Forge is, it's you creating an application experience for somebody else, you get to tailor that experience to exactly what you want them to pay attention. They're an advanced user? You might give them sectioning, and measure, and all kinds of markup, and stuff. They're a basic user? You might say, here. Go use your finger and rotate this thing around on your tablet, because that's all you really want them to be able to do.

So that API, for the viewer, it displays 2D and 3D objects. It uses JavaScript as the base API. Most customers are using a combination between HTML. So they're creating a web page in some way. They're using JavaScript to do some customization on the viewer, if they want to do anything there. And then if you really want to get into stuff, you can use 3GIS to actually do things like-- actually, I'm sorry. These ones were created in JavaScript, the markups and stuff that I'm showing here. But you can get into 3GIS if you want to get into other things that get really kind of deep into changing things like object materials, and stuff like that. We also have quite a bit though in the JavaScript API. So things like, for example, the features of like section, measure, and walk, those are just JavaScript extensions. So the viewer has a whole extension framework. And there's a whole list of extensions on the web site when you look at the documentation for the viewer, that you can enable or disable to add different kinds of capabilities.

But you can also build your own. So if you have a particular capability that you want the viewer to do, that it does not do today, you can build your own JavaScript extension, add it on top of the viewer and create your own experience there. We provide you with all the ones that we have. We've recently added a search extension, a markup extension, and a hyperlink sheet

extension, that allow you to do things like search across the entire model, even across all of its sheets, for example, for information. Or in hyperlinks one, you know, if you're bringing in a Revit model, and you've got links between sheets, and links between different things, will automatically navigate you through all those kind of things.

Some of the things that we've been working on, you know, it would be very difficult for me to give you the list of changes that have happened in the last 12 months in the viewer, but some things I would say is visual quality is much improved since last year. Performance significantly improved, you know, since if you were looking at it last year. The other things that we've done is we've done a lot around the navigation side. So whether it be the walk through navigations. Even simple things like adding a zoom window function for the CAD geeks in the audience, to the way we actually call the model when you do different types of operations. And we'll continue to work on that, by the way, for both web and mobile experiences. And we've added basic VR support. And you'll see us continue to improve that. Right now we've got some very basic navigation in there. We've really going to do a lot more work on making navigating in the VR inside the viewer much better.

For the future, you know, like I said, that better VR support, and a lot more improvements for both the web and the mobile experience. Think about things like when you have a very large building. You know, sometimes when you want to load that, you don't need to see everything that's inside that building to really know what's going on. So starting to do things like forgetting about what you can't see, and only loading what you can see, to improve performance. Or memory, you know, improve how your use of memory, is some of the stuff that we're looking at.

One of the things I just wanted to point out on this particular model. This is a mockup sample that I've got a picture of here. And what it does is it takes the property data from the model, which is listed in this property dialog here, and it starts putting in as markups all over the different model. So that's just an example of a simple application that's been created on Forge with JavaScript that takes advantage of both the data that's in the model, and simple markups. And that's something, you know, we give you the code for that, or you can use our markup extension as well, which is another example of how you can do that.

Next API I want to talk about as the design automation API. The idea of the design automation APIs, it's about automating any kind of design task. Today we have the AutoCAD engine plugged into that design automation API. So that means it's kind of like you're taking an

AutoCAD without the graphics, right? So you know, if you think about what happens in a CAD engine, most of the horsepower is trying to display information on the screen so the operator can interact with that, and that's where most of the compute power is taken up. If you strip that off, and you stick it as a web engine, it is super, super fast and super efficient.

So for example, this can do things like create drawings, query information from existing drawings, modify drawings. You can go through and change the language, for example, of a drawing from one language to another. You want to publish PDF files? You know, these are all the kind of things it can do. But instead of-- you might think, well, that takes a long time. There are average execution times between, I would say, 7 and 15 seconds for really really complex things that are happening in there, because it just has to just-- think, like executing a script without worrying about the graphics. As fast as it can run through and execute the commands, that's what it does. Now, anything you can script in AutoCAD, you can do with that. But the other thing you can do is you can write CRX applications.

So if you're familiar with writing applications on top of AutoCAD you have ARX, which has a whole, UI and creates a sort of user experience. You have CRX, which has none of the UI. If you just want to execute something, and get it done, you can use CRX. So one of the things that we got asked a lot about last year was, hey, how can I get my own data, that I've created and added in XDATA, you know, and get that inside the viewer for doing different workflows inside the viewer?

So we added a sample, and an ability to basically create the format that the viewer uses, and extract that XDATA. So we let you run your own CRX application that understands that XDATA, and understands how to extract it, together with the ability to create the SVF files, that you can go get your own XDATA, you know, out and create a viewable format for that.

So that's just an example of the feedback loop. You know, when you guys have things that you need in the platform, you know, talking to one of us on the Forge platform team, understanding the use case you're trying to do, you know, if we think it's important enough, this is the kind of stuff that happens, right? You know, XDATA data was important. A lot of people were asking for it. We actually created it for you.

Reality capture. So if you look right now, the reality capture API is in private beta. The reality capture API is the one that essentially lets you capture information. 3DR was the example that David gave. So they fly a drone over a site, for example. Capture, today, up to 250

photographs. And then you can take those photographs and generate a 3D model for that. This is another example of the feedback loop that I was talking about.

What we found in that feedback loop of working with 3DR and other partners was 250 20 megapixel photographs was not enough, apparently, to generate enough of a high quality model. So we could do 500 now, OK? So we significantly increased the ability for them to generate high quality models by the amount of data input they could bring in, and the quality that data input. Gives it a much higher quality model.

The other thing that they told us was, hey, it's great that we can do that, but now I want to be able to do things like, I have a reference point on the ground, and when I'm taking that photograph, I know exactly what that reference point is. And now, when I generate the model, I want to make sure that those two things line up. So both we use that reference point to generate a much more accurate model.

And then later on we give you report on, OK, based on the model we generated here's the difference between what you generated as a 3D model, and what that ground reference point was, so you can determine the quality of the model, and if you got a high enough quality model to do what you're trying to do. So we're really trying to make sure those workflows work really well. Sorry, and that API will be released in early next year.

So what other kind of things are we doing as we kind of go down the road? What kind of investments are we making on the Forge platform side? So first of all, the visualization side is one place that we're making investments. You might be familiar with our rendering as a service technology, Autodesk Renderer. You can use that inside Revit today, inside Inventor, or AutoCAD today, to go do cloud renderings.

And you can do things like still renderings, stereo panoramas. You can do 360 turntables, all these kind of cool things to generate renderings. We're celebrating our 50 millionth render here at AU, using that cloud rendering service. So if somebody says, hey, do you guys even sell, or use any of that? 50 million renders have been done on that, by you guys. I mean that's not by us. So a pretty cool celebration for that.

We're going to take that same service, and we're going to put an API on top of it. So you can access that same service, not necessarily through a product, but through a product experience you're trying to create. So if you're trying to create an experience where somebody can take design data, and feed it into a rendering engine, and get a render out of that, we're

going allow you to be able to do that. And it'll do all the same kind of things you can do in the product through the API. So you want to do a still render? You want to do a panorama? You want to do a 360 turntable? You'll be able to do all those kinds of things.

The other one we want to enable is VR. So I talked a little bit about VR in the viewer, and investment in making sure that you have a way to view that, and a way to navigate through that, but what about getting VR content? You know, that's the other hard part. If you've seen any of the VR presentations, or anything that we've done here, you know, we have Autodesk Live, which is awesome for getting Revit content into VR.

But you know, that's one fraction. There's many VR engines out there. There's all kinds of different CAD formats out there. How do I get those into VR? So that's really what we're going to be doing. We're going to be investing in allowing you to take just about any kind of CAD data, getting that into a format that can be consumed by some of the common VR engines out there in the industry. So you can get, whether it's Revit models, Inventor models, SolidWorks models, DGN models, out there into a VR experience. We're going to be investing in that as well.

And then lastly, Sorry, one more after this one. Design Automation API. So I talked a little bit about the AutoCAD side. So we've got that AutoCAD core engine there to let you go do a lot of things with DWGs. Well, we've got other CAD engines, you know. We got Revit, we've got Inventor, we've got Fusion. We've got some of these other CAD engines out there.

And so right now, the next sort of wave that we're working on is the Inventor one. So the Inventor one, same kind of thing. Creating Inventor models, you know, publishing to different formats, being able to create or edit things, building product manufacturer workflows. You've got Inventor Model. You want a Revit family, for example. Instead of having to have a Revit in Inventor, you know, you can feed it into the API, and out will come, you know, a Revit family file for you.

On the Revit side, same thing. You know, I want to create a Revit model. I want to modify a Revit model. Maybe I'm doing it a model check scenario. Maybe I'm creating some Revit families. You know, whatever that happens to be, you know, we'll have those same kind of scenarios, you know, with the Revit design automation API. You know, I suspect when we're going to be standing here next year, we're going to be showing you lots of examples of cool things that both customers and partners have done with those two new APIs.

On the enterprise side, you know, what we're seeing a lot with Forge, and you saw that a little bit with J.E. Dunn, is we're seeing a lot of companies wanting to integrate Forge into their existing systems in their company. Sometimes that's products like Box, and Google Drive, and Dropbox, and SharePoint, and things like that. Sometimes it's construction management systems, and ERP systems. But they want to be able to do those kind of integrations.

Today, we can do some of those. But for example, a lot of our APIs are what we call polling APIs. So when you when you submit something to the API, it will have a status, but you have to go ask it for the status, right? And it works, but you know, you have to be patient, or you have to be like the kid. Are we there yet? Are we there yet? Either way is not not as efficient as it could be. So we're going to be leveraging a technology called WebHooks, where you can subscribe to events, and then when an event happens that you care about you'll automatically know about it. And you can be a lot more efficient in your application and your customer experience, and we can as well. So you'll see that throughout a lot of our APIs. These are a couple of the ones that we'll be using it in. We'll be using it in others, and as we build new APIs as well.

From a BIM 360 perspective, you know, they have their issues service, their IFI services, you know, HQ, all these different kinds of ones. You'll start to see APIs come out for some of these different product APIs, as well. So more expansion there. And then, where it makes sense, if that service makes sense as an independent service that you could use in other workflows, with other applications, we'll expose that as an impending service as well. So you might see an API for a product to use the issue service, for example, and then an API web services issues completely by itself, which you don't need to use BIM 360 Docs, in order to use.

And then lastly on security and compliance. You know, you can build a secure application with Forge. And that's one side of things, right? You know, you know, you've got all [INAUDIBLE] and all these different kinds of technologies to allow you to build a secure application with Forge. But many customers and companies will say, yeah but what's your security compliance? You know, how do you manage your back end systems? How do you respond when a security threat happens?

You know, and that's more about compliance than it is about actual security. So you can have a fully compliant back end, and you could build an unsecure application from it. I want to make sure you don't confuse the two things. So Forge is very secure today. What we're working on

is that compliance part. So when somebody says, do you have this compliance standard? You we can say, yes, we meet that in this way. And these are the processes we have in place in our back end to make sure that we can respond to different security threats that happen out there, and how we do that.

So SOC2 is the first one we're going for. We're working on that now. Our audits will be happening in the coming months for that. The next one will be sort of the MIA model clauses. A lot of these compliances have a lot of commonalities. When you get one you start to get another, and you get another. So you'll see us invest more and more throughout the next 6 to 12 months in these different compliance standards. So if those kinds of questions come up in the building on Forge, you know that we're working towards those.

**BEN COCHRAN:** I think now it's time to see the real code.

**SHAWN** No, I think.

**GILMOUR:**

**STEPHEN** Actually, that's not strictly true, Shawn, because you and David are very fast talkers, so we're a  
**PRESTON:** little bit ahead of schedule. So I suggest we take a few questions.

**SHAWN** Sure. We can definitely do that.

**GILMOUR:**

**STEPHEN** It means I get time to actually line up more demos to show people. And I get to line those up,  
**PRESTON:** and you can take some questions.

**SHAWN** Let's do that.

**GILMOUR:**

**BEN COCHRAN:** Some things to address about the compliance I wanted to call out as well. Getting compliancy means that we have an audit in place by a contributor. So like, [INAUDIBLE]. And so what it means is that, it's not that we're not secure, we don't have these security practices in place, but it means that we haven't done the audits, or completed them yet, so a third party can't come and stand behind us, and say, yes, they've done these practices around security. And like, as Shawn said, SOC2 is the first one that we're going for. And there's other audits that we need to do for other, you know, regions around the world, and [INAUDIBLE].

**SHAWN** Yeah. That's a great point, Ben. So when you're doing any kind of compliance, you have to

**GILMOUR:** already be compliant before you get audited. So we've already done the work to be compliant. Now we're in the auditing phase of getting our services audited. So questions. No questions so far?

**STEPHEN** You got to have some questions. I haven't lined up my demos yet.

**PRESTON:**

**SHAWN** Yeah we got to give-- so remember, this is how you give Stephen some time to--

**GILMOUR:**

**BEN COCHRAN:** I'm going to ask a question--

**SHAWN** No, there's one right here. We got one.

**GILMOUR:**

**AUDIENCE:** Is there a cost associated with using any of the services?

**SHAWN** So the question, in case you guys didn't hear it, is there a cost associated with using any of the

**GILMOUR:** services? And the answer is yes. So Forge is a consumption based platform. I think we're going to talk about pricing in a little bit here, but essentially when you get a subscription to Forge, some things come with it. So for example, I'll give an example of maybe a flow. If you bought like BIM 360 Docs, or BIM 360 Team, or a fusion team, for example, and all you were trying to do was get access to the data in the product you already bought, and build integrations around that, you know, that's free. You already paid for storage. You already paid for that application. You know, that's free.

If you were to then say, hey, I want to go take a file out of BIM 360 Docs, and then I want to go use the Design Automation API to go modify that drawing, that would be a consumption at that point, because you've now used another service to actually create something new. And so Forge, charging is really about when you create something new. So if you translate a file to another format, you're going to get a charge for that. Or if you exercise that design automation, you'll get a charge for that. And I'll show you the pricing. I got a chart for the pricing. I'll show you that in a minute. For the SaaS app integration stuff, you know, that's all part of when you purchase your SaaS app. Other questions?

**AUDIENCE:** I was just going to ask, are there any Forge partners in the room? Anyone already developing Forge? Great. If you just want to introduce yourself, and tell everyone a little bit about what you're doing with the cloud platform.

**AUDIENCE:** Sure. I'm Todd from Dragon Innovation--

**AUDIENCE:** And you can stand so everybody knows.

**AUDIENCE:** All right.

**AUDIENCE:** You guys, we couldn't be here without you in the class. We move so fast. And everything I just talked about, we couldn't mean everyone, so go ahead. If you guys just want to [INAUDIBLE] the things.

**AUDIENCE:** So Dragon Innovation, we help [INAUDIBLE] go from [INAUDIBLE] prototypes to production to building software to help support that process. That's really [INAUDIBLE]. So the person who did the Forge, announcement, [INAUDIBLE] was a quick integration to the [INAUDIBLE]. So the experiments viewer in there, so you can spin the model around, take a look at it. Actually, for us, the Roadmap is the [INAUDIBLE]. Being able to sort of [INAUDIBLE] the cloud structure put together among our customers [INAUDIBLE] to take a lot of the kind of the undifferentiated [INAUDIBLE].

**SHAWN GILMOUR:** Yeah, and by the way, that's a typical journey. A lot of people, they get excited about the sexy, hey, god. Wow I can twirl this model around inside a browser. Their mobile device is really awesome. Then they go, oh, there's data here? What can I do with that? And that's kind of the journey that we've taken with Dragon Innovation. It's like wow, now I can actually, instead of-- If I remember, if you create a BOM today, you literally go in, and you type each of the part numbers, and what you want. And so now they're working on a process where they can at least go and extract, even if they don't know all the information, they can at least say, here's the 10 parts that are part of this thing, go in and fill out all the data, right? So a lot of times there's a lot of value in having access to that information. Now, I'm informed that Stephen is now ready to give us a demo.

**STEPHEN PRESTON:** But if anyone has any other, I mean, you know, we were kind of starting to pick on members of the audience to do their presentation for us then, so I mean, before I do, does anyone have any specific [INAUDIBLE] pick on someone else to actually come up here and put on a microphone. Does anyone have any other questions to show on before I move into a few demos, just on the general, you know, the APIs we talked about, and the roadmap for the future?

**SHAWN** Sure. Go ahead.

**GILMOUR:**

**AUDIENCE:** Is on-perim Forge a thing?

**STEPHEN** Please repeat the question, Shawn, because we we're being recorded.

**PRESTON:**

**SHAWN** Absolutely. So the question is, is on-perim available for Forge. I think it depends on what you  
**GILMOUR:** mean by on-perim. So today obviously the services run in Autodesk's infrastructure. And today, we don't have an ability to take those services and run them on your premise. In a lot of cases what people are doing is if they're concerned about the data, and where the data resides, you can upload into literally a temporary, as little as 24 hour, kind of location, where we just automatically clear the data out. You can generate what you're trying to generate, whether it's design automation API, the recap API, or the model derivative API. Then you can download that package into wherever you want to access it to after that. So you know, right now, that's the solution we're providing to people who want to not necessarily store the data up there. They can go put it on their premise, and access it from there. We don't have a way to put the services on your premise right now.

**AUDIENCE:** So the viewer [INAUDIBLE].

**SHAWN** The viewer's not really a service. The viewer, it's JavaScript in a browser. So essentially, it's  
**GILMOUR:** just-- so what you end up doing in the case that I talked about is, you just end up pointing the viewer at whatever location, you know, you stored your data, instead of it automatically points back to where it is at Autodesk, right? We give you an URL to say, go point the viewer here, and it will load the data. You're just going to give it a different location. That's what you're going to do. But the viewer's just JavaScript.

**STEPHEN** Actually we had a lot of questions at the Forge booth about that. I mean, what we're offering is  
**PRESTON:** a set of web services. For storage it's future store your design files, so you can act on them with our web services. But typically, you will be running your own server, and from your server you'll be running code on your server, and you'll be serving up web pages from there, and you will be then making REST API calls to our web services, in order to do things with the data. Cause a lot of people seem to think that we're actually offering like an AWS type service when they saw this.

**SHAWN** Ah, yeah, yeah.

**GILMOUR:**

**STEPHEN** That's why I'm just clarifying that.

**PRESTON:**

**SHAWN** OK.

**GILMOUR:**

**STEPHEN** OK. Any final questions before we move on to a few demos?

**PRESTON:**

**SHAWN** I think it's all yours.

**GILMOUR:**

**STEPHEN** OK. Well I have a lot of demos here. As you can see by the number of tabs across the top of the screen. So we should have plenty of time to take things slowly. So I wanted to demonstrate-- a lot of the demonstrations kind of revolve around the viewer, because ultimately when you you've done something with that data you tend to want to show it to people. And the usual way you show things to people is by showing them in that viewer. So most of these demos will show video. But the first one I wanted to show you is really more of a model derivative API, and what we call-- sorry, the Data Management API, which is accessing data on the Autodesk cloud. And also the Model Derivative API, which is extracting data from your CAD files, and also translating file formats from one format to another.

So first thing we have here is just as a quick demonstration. We do have BIM 360 data hooked up here. So these are actually some BIM 360 projects that I have, which I'm actually not going to work with here. I just wanted to make the point that the Data Management API can access BIM 360. It can also access A 360. We're just expanding the number of 360's that the Data Management API can access. And so you can see just here-- we're basically querying the API, finding out the folders, the files, the versions of files, and we're just populating this tree view. But I'm not really a BIM guy, to be honest, so I'm going to go to A 360. And I'm just going to expand my hub, which is basically my user account for A 360. And these are all the projects of which I'm a member.

A colleague of mine has very kindly assembled some nice little drawings. So I'm basically going to-- you know the first thing I'm going to do is-- well it's kind of getting close to

Christmas, you know, Thanksgiving's just around the corner, and then it begets Christmas. So I'm going to kind of create a Christmas scene. So the first thing I'm going to demonstrate is accessing files on A 360. Load them into the viewer, and actually combining multiple models together. So I'm going to load up a house, first of all. Let's give it a second for that.

And you've no idea how nervous I am now, with using the conference internet to do these live samples. Just getting my excuses in early. I mean, you can see already, it's not going to be fast. So it's good that we have plenty of time for the demos. And it's also, I've had these sitting here for a while. So it's possible I'm going to have to refresh the page, because they do, for security reasons, log me out. So here it comes.

So here we have a kind of, you know, pretty typical Revit model of a house. So now we have a house, and it has its backyard. And we want to put a snowman in the backyard, but I don't actually have a snowman, so instead I'm going to load up a BB8 Droid. And the BB8 Droid, yeah he's a little bit big, because we ran these with different scales. So the first thing I want to do is just to scale him a little bit. And I think if I go to 0.01 that's probably about the right scale. Yep. That should do. And I'm going to tr to--

**SHAWN** Stephen, I feel like I'm in a Ghostbusters movie.

**GILMOUR:**

**STEPHEN** Really? Was BB8 in Ghostbusters?

**PRESTON:**

**SHAWN** No, but there's that big snowman guy.

**GILMOUR:**

**STEPHEN** Oh, yeah, yeah. Whatever you think of next is going to destroy your web demonstration. OK so  
**PRESTON:** now I'm just going to translate it, and move it onto the law. So I happened to have worked this out in advance. Just cheating a little bit. Nine to six. OK. And then we can scroll out, and there's our BB8 droid like a little snowman sitting, cause of course you don't get snow up here in Las Vegas. So there he is.

And so just an example of what you can start doing now, you can take different models, and you can combine them together in a kind of configurator type approach, if you want. But you saw me translating not model using this dialogue. I can also move things around just by clicking on them. So if I click on this translate here, click on this guy, I can actually just move

him around using this little widget. And this is all custom programming. So you got a basic viewer, and then I've just added some simple JavaScript-- well, I didn't add it. Someone who works me added it. I'm a manager, so my web programming now is to say, hey, Phillippe, could you write this sample for me, please?

But you can also do stuff, like if I select the house instead, you don't have to move a full model. So I can actually select the a garage roof here, and just move that around as well. So you're kind of getting some interesting capabilities coming in here, where you can actually, either programmatically, the through applying the user interface, move things around in the viewer to do whatever you want. And you can obviously start to think now, you can start to do animations as well.

So I'm actually going to flip ahead to an example of one of our partners who has created an animation. Anyone here shop in IKEA? Ever been to, you know, the flatpack furniture stuff? OK. Not that many. OK. Well they've got a big one in the Bay Area in Emeryville, and it's like you walk through the doors. There's a big sign that says welcome to hell. And you go, and you get the flatpack furniture, and they give you this piece of paper with almost impossible to understand instructions. But you know, imagine-- I hope there's no one from IKEA in the audience.

So this company, Dotty, anyway, have developed this-- they're actually selling this for people who are running support organizations to give animated instructions to support staff. But as they're example they decided to solve this very difficult problem of how to show people how to actually assemble their IKEA furniture. So here we are taking the concept I just demonstrated with the manual movement, and we've kind of automated it. And they developed a tool where you can program in these animations, and just apply them to your own model, which is kind of cool. OK. So that's that one. OK. So what else do I want to do with it? OK. You finished now? Good. OK.

And we have another sample, which again, we have this kind of tree view. And we're do the same thing. We're using the Data Management API to query A 360, and BIM 360 as well. And in this case, we're also showing that you can see version information, as well. This is not a problem. You can do it. Oh, it doesn't allow me to do it. I'm going to have to refresh this one. Try again. Expand that. Yeah. There we go.

Actually this Stirling engine is actually a Fusion model. So a colleague of mine, Adam Norris,

has been editing this Fusion model in Fusion 360. And so you can see he's actually done some edits. And so it stored a second version. So you know, when I click on this, it does something similar to a previous example, in that it's going to load up in this viewer over here. Just wait a moment for that to appear.

And so here's the Stirling engine. And you can see, what he's actually done in the second version, he's just done a simple modification for material. So you know, using the viewer I can query this information. I can see it in his original model this was polished titanium. Whereas, when I go to the second model, and you can see it's actually translating information on the fly here, to display in the viewer, and I can click on that same thing, you can see it's changed color. And so obviously when I look at the properties, he changed it to gold. So that was the only change he made.

But then you get an interesting situation where, you know, you might not want to sort of-- so one thing with the model derivative APIs, as well as displaying things in the viewer, you can actually extract properties, and geometry, to use in your own applications. So for example, you might want to just extract the geometry from one component of this model. Let's say I'd broken, or someone had stolen my little gold rocket here, and I want to, you know, 3D print a replacement. I can actually select this, and it should, in this tree view here have actually selected it. Yeah. And I'm going to actually select that as an OBJ format, and I'm going to download it. And you can see that it's done this extraction already, and it's downloaded it, and I can view this in my browser. And because it's a Mac I can actually see a live thing at the OBJ.

So I've now extracted the geometry from that model. And of course, we can kind of go a step further than that. You know, I've got my 3D printer, so I can put that into my 3D printing software, and-- where was it? It was probably this one wasn't it? Yeah. Make it open that up. And it comes in very small. We haven't got the scale set up correctly. So I'll just selected all the models, and I'm just going to scale that to-- I think probably 3000%. And there it is. And then I can lay it flat. Oops. I didn't quite add it here. So now we have the-- didn't quite make it flat. You get the idea anyway. I kind of brought this into my 3D printer preparation software, and now I can actually process that into G code, and actually go away, and print is. So very easy to extract geometry, and then working it with other applications.

OK. We have you know, some of the translation formats we have. If I now go back to that Forge folder, and select the house that we were playing with before, which is the house design, and open this. And again, you can see we have the version information. We have that

same house. And this time I can select the entire model, and I can export it. Because this is a Revit file I can export, as well as VOBJ, I can export to IFC, or DWG. So I'm just going to try the IFC export. Going to click Download. Now, this is a big file, so we might have to come back to this in a minute. In fact, let's see what else I can show in that sample. You can see it's downloading. We'll give it a minute.

And actually while that's downloading, you can see when I select different file types-- I'm just trying to see. Let's go back to that Stirling engine. Different translated formats are actually possible. So generally from mechanical file formats you have the option to translate into step, IJs, STL, and also FBX here as well. And we're gradually building out the translation paths that you can run. At the moment it's primarily translating Autodesk formats to various other formats. And we're just going through the process of adding those as we go along. As you can, imagine it's quite a hard job to do that, so it takes some time.

So where are we? So that's now downloaded. OK. So I now need to go to Windows, and I can open that file, just to prove it works. You can see I've practiced a few times on this. And now we have. There we have the model in IFC, which some people like, if you're an IFC kind of guy? Are there any IFC people in the room? People who like IFC as well? Are you European, by any chance? Yeah, I thought so.

OK. Let's go back to the demos. So I think that's probably enough of those two samples. So we can we can move on. Simple example here. I mean, one thing that a lot of people like to do is they don't necessarily want all of their data on A 360. Quite often they use other storage systems as well. But it is kind of nice to synchronize the files between different locations. So this is a very simple integration example here, showing how you can transfer files between, in this case, Box, and Autodesk. But we have over samples. You know, things like Google Drive, and SharePoint, and things like that. So I can actually select a folder here, which I'll call Stephen's Dev Days Demo folder. And I'll take maybe this file here. And I need to refresh. I think it's logged out. Refresh this one as well.

**SHAWN** So, Stephen, maybe you can talk about why you're refreshing some of these.

**GILMOUR:**

**STEPHEN** Yeah, it was because I set up these demos right at the beginning of the class, and basically  
**PRESTON:** the demo is set up to expire after a set amount of time.

**SHAWN** Yeah, so they have a security token that expires, and if you're not using it, you have to refresh

**GILMOUR:** that token.

**AUDIENCE:** [INAUDIBLE] such a way to re-authenticate a security token, it wouldn't update as quick--

**STEPHEN** Yeah. In real life you'd keep refreshing it, but we don't do that.

**PRESTON:**

**AUDIENCE:** [INAUDIBLE] understand the question about [INAUDIBLE].

**STEPHEN** Yeah.

**PRESTON:**

**SHAWN** You just keep refreshing your tokens.

**GILMOUR:**

**STEPHEN** In some cases I refresh unnecessarily because I just get impatient.

**PRESTON:**

**SHAWN** Because you get impatient?

**GILMOUR:**

**STEPHEN** Yeah. But anyway, let's go back, and find my folder again. Where was it? Stephen's Demo

**PRESTON:** Folder. And I'm going to take this, and I'm going to select it. And oh, that's it I wasn't working. It didn't need refreshing. I was selecting the wrong thing. So now I can send it to Box. And I can just click that, and you can see here that it's just preparing to send 1,000 a second. It says it succeeded. So when I open this now, there is the blower file that's been added.

And I can go the other way as well. So if I take some models from here, and maybe stick those in my personal folder, Stephen's First Project, and just open that up to make sure I'm not cheating. This one should do. I can send that one over to Autodesk. And now you see it's transferred. So obviously, I'm doing this a file at a time. Clearly you could just automate this, if you wanted to. So you can sync your files any where you like. You can move them between A 360 projects, you can move them from A 360 to BIM 360. Or you can when we implement the upload capability for BIM 360. Right now, A 360 is read and write, you know, upload and download. Whereas BIM 360 is download only, or query only. And probably sometime early in the new year we'll have the ability to upload files as well, via the API. OK. So let's close that one.

OK. Here's another example just to show-- the way you've seen the viewer, up to now, it kind of had the A 360 style user interface. And I just really wanted to demonstrate that you can kind of have a headless version of the viewer. You can start with something that doesn't have any kind of UI associated with it at all. No buttons, or anything like that. And you can just use it. You can add your own user interface. So your user interface can be anything you can imagine. You know, this is just for the web programmers in the room. We basically got a div in the HTML which is containing an HTML5 canvas element which has got a web GL context. And you can just embed anywhere on your web page through JavaScript. You can interact with the viewer. Events in the viewer can trigger events elsewhere on your page, and change data there. And so you can just basically do whatever you like, in terms of customizing the viewer.

And the viewer itself is built, it will run on any browser which is web GL compliant, which means every modern browser. It will run on mobile devices, as well. We actually use a library called 3JS, which is pretty much the standard JavaScript library that wraps web GL for doing 3D programming on a web browser. And on top of the 3JS, we build our own view or API, which means that we give you a high level API. If we haven't given you an API, you can drill down, have it to the 3JS level, or even the Web GL level, and you can tweak stuff.

So just to give you an example of the tweak ability, here we have-- ha anyone seeing project Dasher on Autodesk Lab? OK. So it's basically around taking data from IOT sensors in the building, and displaying them in a context for building. The original sample was built on Revit. And a friend of mine in Autodesk research, Ken Warmly has been working to translate that to the viewer. So now you have this lovely 3D model of our Toronto office. And we can display some IOT data. So what I'm going to do here is I'm going to remove the surface shading. And this is all custom code again. And I'm going to hide the textures there. And I'm going to just do a bit of navigation, just to display the fourth floor of this building. And, hey, presto. Zoom in on that a little bit.

And you see you've got the fourth floor here. You've got lots of detail. You've even got the cubicles, and the chairs, and what have you, from the Revit model. And what I'm showing you, this kind of moving red, is we recorded, over a period of 24 hours, actually a weekend when heating was off. And so the sun was rising over here. And that's why where at the start of the day you see the red traveling this direction, and then when the sun set, it travels back again. So we're essentially overlaying a heat map taken from IOT sensors, which we recorded, and we're replaying it, obviously, a lot faster than real time, to give you an idea of how you can

visualize data in the viewer.

And for the techies amongst you, what we've actually done is we've replaced the material for the floor, with a material which has a custom web GL shader. And the custom web GL shader actually has code, which is actually taking data from an online database. So we're streaming the data from the database, and then dynamically updating the material to show the heat map. You know, it's just a very, very powerful way of displaying data, that kind of thing. In this case it's a dynamic heat map. But you can just color different objects, different colors, if you like.

And kind of on the IOT theme, we have this example here, which hasn't loaded. Oh, there it is. So this is the partner, Dotty, who I showed you the IKEA example before. They're actually working on a visualization platform for large machines, particularly in the oil industry. So tankers, oil rigs, that kind of stuff. So they've actually got a-- you know, they wouldn't let me show this, but they have a detailed model of an entire oil rig, where they're applying this system. This is a simplified model. And essentially, what they have is, on the model, they have tags which mark where the sensors are, or more to the point, the tags are marking where a sensor is saying that there's a problem.

I can reassure you that in this case, it's fake data. We haven't really got an oil tanker going around with that many red flags on it. But you know, you can move around like this. Or they have this. You can just scroll into a particular area. And I can click on one of these sensors, and then if I click them one of these tags, it actually gives me information about the incident. I'll click on another one, and it changes. So I, as an operator, can see exactly where the problem might be, and see the information about the problem. And sometimes the valuable information is where the problem is.

So imagine the case of a building, and if a smoke detector had just gone off, it's kind of helpful to know where the smoke detector is relevant. Rather than having a display on your screen that says, smoke detector 57 has detected smoke. You can actually go bang. Straight away you've got an icon in your building, and it says, where is there a problem? Or, you know, a burglar has just smashed a window in this particular location.

So just giving you some ideas how you can start to use the viewer for visual reporting, which I think is one of most powerful aspects of a viewer. And kind of continuing the theme, in this case this car seat was designed using inventor. And so if I click on this part here, you have all of this data that has been extracted from the Inventor file by our Model Derivative API, and it's

now available in the viewer. Except for this bit here. This bit that says database is actually coming from an external database. We've actually got a Mongo database running on our own server. And it's basically got material information, which we are applying here.

And so in this case, this seatback is rubber. So if I scroll down here-- this is a grid view of the data in the database-- and if I change that from 10 to 20, you actually see, in the palette over here, you should see that update live when I change it. So you see that's reflecting the live update. And we've also got some graphing down here. And I can do cool stuff like hey, show me all the rubber objects in the model. OK. There's not much rubber. Show me all the steel. There's the steel. Show me the ABS plastic. Show me the poly-something-or-other resin, et cetera.

It was kind of nice. So that was isolating. And I then, you can kind of the visual reporting as well. So I'll just scroll out a little bit. Let's do a visual report the same thing, the material. And so now I've recolored the components. So they came in with the materials I designed in Inventor. And now I've basically recolored to say, hey, you know, every different color is a different type of material. And when I go over here, and click on one of these, it actually isolates-- again it does the isolation thing, except it's keeping the colors this time. Which is kind of nice. Let's just show all. Close that one down.

Another example here is you can actually, if you like, you can very easily store states of the viewer. So you can very easily store, I think, the camera position, which objects are visible, et cetera, et cetera. So we can do things like-- oops, I need to scroll back in again, so I can-- you know, I can create a view like this. And actually, in this sample we've implemented some custom tagging as well. So we've actually got these tags. As you move the model around they're actually attached to particular points in the model. In this case it's telling me-- I'm not sure what it's telling me. It's the actual part number, and the description I think it's combining. And you can see, just scroll those around, and I can just go to a different view, go back home. So you can very easily create new views.

And again, some of this is standard viewer functionality, but I'm just showing you things you can do with the viewer API as well. So all of that custom annotation, again, was just adding a little bit of JavaScript code to draw to draw those extra lines. Some extra features for the viewer, which you may or may not have seen. So what you get for free is things like sectioning. So I can actually section through this. Actually, that's not such a good direction. So there we go.

So we can create section planes. We can explode. So we can actually see how the thing is assembled together. We can view the model structure. And you know, because this comes from Inventor, this should be familiar, as a kind of model structure you get from Inventor. If it was Revit it would look slightly differently. And I can drill down. And in this case the isolation is kind of ghosting the other components. You get the idea. Where should we go next?

As kind of another example of being able to kind of do with visual reporting, and navigation, in this sample we have-- the viewer can display 2D, as well. We tend not to show 2D because 3D just looks cooler. Sorry AutoCAD users. But, you know, if I click something here in the 2D, it highlights in green. And when I click it, it isolates in the 3D model, as well. We can do that kind of visual reporting. Again, if I do the themes here, I can say, OK, you know, color these by level. And they'll be color coded by level. And the level information is something that was extracted from the Revit model, and is included in the data, which we're displaying in the viewer. Oops. We need to turn that off.

And of course, you know, as usual, you know, here's just an example on-- that wasn't a good thing to click on, because it didn't have much data. Yeah, that's better. So you can see the typical kind of Revit family instance information, which is being included there. So all the information that you'd expect to come out of a Revit model is all in there. And you can query that in your own applications. How are we doing for time? OK. What should we move to next?

SimulationHub. I like this one. So SimulationHub are a partner of ours. They're actually doing presentations down at our Forge booth. They're doing fluid dynamics simulations, using the Sorry, they're using our Model Derivative API to extract geometry. The geometry they extract from the original model they're using to do their CFD simulation. Then that translates into models, so it can be viewed in the viewer, and injecting their own graphics into to viewer to display the results of their simulation.

So an examples I've got here is this kind of-- guess I'm on a Star Wars theme aren't I, today? Because this kind of looks like one of those Star Wars houses. And what I can do here is I can just use the standard section tool, because their simulation was inside the house. And there you have, in this case, this was the entry for air blowing. And it's showing the airflow through the building. And I can actually even do a little bit of animation. I don't know how well you can see that, But if I zoom in, you can see the flow lines, which is kind of nice. You get the idea anyway.

OK what else do we have? Just a quick example of searching, really. Just to show you can very easily implement search. So in this case we have-- this is one of our favorite models cause it just looks really nice. But I can search for, you know, show me all the tires in the model, and it highlights them. So the search API, and I can search within just this view. Or if it's like a Revit model, it has lots of sheets, I can search across the entire model, everything, and it will tell me, you know, if I search for a particular window instance, it will show me in every sheet that it displays that window instance. So I can very easily, you know, compile reports on, you know, what part numbers are used where in my model. You know, just maybe an example there is show me all the springs in the model.

**AUDIENCE:** [INAUDIBLE]

**STEPHEN** I'm sorry, I didn't demonstrate to measuring tool, did I? The measuring tool does work.

**PRESTON:**

**AUDIENCE:** OK. The scale [INAUDIBLE].

**STEPHEN** Well, if someone set up their scale correctly in the original model then the measuring tool will

**PRESTON:** pick up the scale from the-- you know, as part of the translation process, we do take account of scale. So when you measure in the viewer, you should see it in the units.

**AUDIENCE:** When you're measuring does it give you X, Y, Z?

**STEPHEN** Yeah. Yeah. It gives, you the, you know, closest distance between. But also the, you know,

**PRESTON:** delta X, delta Y, delta Z. Just an example here, as someone who's doing something in the architectural realm-- have to be careful here what I click on, because some of these are huge models. But basically they're creating a service. This started off as a free tool that they did, just to advertise themselves, Building 360. And it's kind of turned into a service that they're creating for people.

So you can click on any of these models, and anyone can upload a model here. They are a Dutch company so they have an English website, but most of the models got Dutch writing. And so you see you've got the usual model here. You even have access to the drawing. So if there is a drawing-- and I chose one without drawings. I'll choose another one in a minute. But it's just for usual functionality. Actually, let me do a measure. This is asking for trouble, isn't it?

So you see that, as a result of the measurement. So you know, you can see it in feet, and you

can see it's got the deltas as well. I'll just go back to their home web site and see if I can find a model to actually-- Which is a restaurant?

**AUDIENCE:** Scroll down a little bit.

**STEPHEN** Yeah, I don't know what Dutch for restaurant is.

**PRESTON:**

**AUDIENCE:** The third one on the bottom.

**STEPHEN** This one?

**PRESTON:**

**AUDIENCE:** Yeah. It has drawings.

**STEPHEN** OK. Well, all the Dutch speak English so I don't have to learn Dutch. See, he speaks English.

**PRESTON:** So I'm OK. You ask a Dutch guy if he speaks English, and if he says kind of, that means he speaks it better than you do. There we go. So now we have some drawings. And so, you know, these are all the sheets that came in from Revit, obviously. And so you have access to those as well.

So the only other example I wanted to quickly show-- that's a kind of flying over view of the viewer, and some of the new APIs, is AutoCAD-- actually, no. The product formerly known as AutoCAD IO is now called Design Automation, which is what Shawn talked about, headless version of AutoCAD, running in the cloud. And very soon we hope to add Revit, and Inventor as well.

And this is an example that Ken Warmly he wrote for his blog. So basically it uses AutoCAD in the cloud to convert a photograph into a jigsaw. So I'm just going to browse for an image here. And I have this little picture. This girl here has committed suicide. OK. And it's just now sent a drawing. It's now processing the photo. Turn it into a roster. Send Ended up towards CAD in the cloud. And now we can download the drawing. And hopefully I had AutoCAD open. I did. And it is this one.

That's where we have my jigsaw ready to print. It's not CAD IO. And I can just select these different-- There's just different polylines he's got here you can see. OK. So I think that's it for the demos for now. Yeah, and if we have time at the end, I can always fire up some more. But-

-

**AUDIENCE:** Remember these demos are also on Git too.

**STEPHEN**  
**PRESTON:** Oh Yeah. I'll show-- good point. I'll show the Git websites. So a couple of things. If you want to get started with this API, go to [developer.autodesk.com](https://developer.autodesk.com), and basically you sign in with an Autodesk ID. And you can immediately create a free trial which lasts for a year. It's all self-service. You need an API key to use these APIs. As you can self-serve for that. All the documentation for different APIs is here. Quickstart tutorials. You know, I'm not sure we've got a link to GitHub from this site. We need to fix that. But if you search for-- is it in there somewhere? Is it? But anyway. Do we offer? Is it there somewhere? But anyway.

**SHAWN**  
**GILMOUR:** You've got it right at the top.

**STEPHEN**  
**PRESTON:** So yeah, if you just search for the autodesk-forge organization on GitHub, there's load of samples there. And if I choose a random sample, you have a nice description. It tells you how to use it. In most cases, you will have a link to a live version of a sample as well. So you can see the sample as ti's supposed to run, and you can download the code onto your own computer, and set it up and running. And an easy way to get up and running quickly is just start one of our samples. We have various languages. We're building out our sample set all the time. And as usual, if you want to do something which we don't have a sample for, you can ask for help, and we will help you. We will tell you how to do what it that you ever need, and possibly even write a custom sample for you.

**AUDIENCE:** A number of the samples you showed are on there.

**STEPHEN**  
**PRESTON:** Yeah. A lot of the samples I showed are on there.

**AUDIENCE:** Are most of them a few hundred lines, or a thousands lines?

**STEPHEN**  
**PRESTON:** I mean, the basic, getting the viewer in a web page, is like 5 or 10 lines of JavaScript. Nothing more. You basically instantiate the viewer, you point it at the file you want to display, and that's it.

**AUDIENCE:** [INAUDIBLE]

**PRESENTER:** What did you bring up the website for? You just brang up the website.

**STEPHEN** Do you want me to?

**PRESTON:**

**PRESENTER:** Yeah.

**AUDIENCE:** [INAUDIBLE] You know, it's not [INAUDIBLE].

**AUDIENCE:** According to the website uses [INAUDIBLE] and you kind of want to use someone's beautiful child. You don't have to rewrite it yourself. Is there an easy sort of path [INAUDIBLE] just put this on top, and [INAUDIBLE] as well.

**STEPHEN** So you can definitely inject 3JS objects into the scene. So that's definitely possible. And if you

**PRESTON:** know 3JS it's probably quite trivial for you. We have samples where we do that.

**AUDIENCE:** I guess if you've got direct access to the 3JS object you just basically, you know, almost set that menu, use the controls from there.

**STEPHEN** The only issue with adding stuff to viewer with 3JS directly is you don't get the intelligence,

**PRESTON:** because obviously when we bring it in from one of our files, and we load it, we're attaching all of that metadata to it. So it knows that, you know, this part is part of this assembly, and it has this object data associated with it. Clearly, if you just create a 3JS object, and just shove it in the viewer scene, you don't get that. You'd have to kind of probably write some extra code to deal with that yourself.

**AUDIENCE:** Well, for example, if you wanted to explode, 3JS knows that [INAUDIBLE] so you want to [INAUDIBLE] should be able to do that.

**STEPHEN** I think we'd have to experiment. Ultimately you can, and the question is, how easy is it to hook

**PRESTON:** up? But you know, if you wanted to, we could definitely have someone from my team talk to you, and talk you through-- Actually, if you come down to the Forge booth, a guy called Philippe Leavesman, he's probably our best 3JS guy, and you can talk to him. He should be by this afternoon. OK.

**SHAWN** I want to talk a little bit about the pricing, and then I think we're going to take some questions.

**GILMOUR:**

**STEPHEN** OK. Do you want me to?

**PRESTON:**

**SHAWN** So forge.autodesk.com. You know, this is where, as Stephen said, you can go get started. It's  
**GILMOUR:** where you can go and try it for free. So your first path for Forge is go up here, sign up. You get a trial that gives you 500 club credits to start out with. You can use that for up to a year, if you haven't consumed all those credits. What we find with most people, that trial is good enough to get you going on your first application, because you can get quite a bit of usage out of that. Stephen, if you want to click on the See Pricing for me. So essentially the way we've priced Forge is it's a consumption based API. I talked about this a little bit earlier. So some of the APIs are just included when you subscribe to Forge. Some of the APIs are based on consumption. Did you pick see [INAUDIBLE].

**STEPHEN** Yeah. I did. You're on there.

**PRESTON:**

**SHAWN** How interesting, because it's not up there.

**GILMOUR:**

**STEPHEN** That's weird.

**PRESTON:**

**SHAWN** So for example, I'll try to give you a couple of workflows, so you can kind of understand how  
**GILMOUR:** the pricing model works. So the first one I talked about earlier, if you just want to use an API in one of our products, like BIM 360 Team, or BIM 360 Docs, or Fusion Team, and you want to use the Forge Data Management API, for example, to do some of the things that Stephen talked about, where you're grabbing data from Box, and putting it into our product, or grabbing data from our product and putting it into Box, you know, that's not going to cost you anything. You're just shuffling data around, and you can basically use those APIs for free.

You can also get access to any of the version data, metadata, project data. You know, all that kind of stuff inside the SaaS applications as part of that API as well, and that's no charge. If you want to use one of the services independently of one of our applications, so for example, the example I gave was let's say you go grab a DWG file, and you want to use the Design Automation API to go modify that file. Or maybe you're going to create a completely new DWG file, and later on you're going to either store it in Box, or Dropbox, or you're going to store it in one of our applications. So what you'll get charged for is you'll get charged for the actual processing of creating that DWG file.

So for example, I talked about in the Design Automation API, average time is anywhere

between 7 and 15 seconds to create A DWG file, or publish it to another format. Things like that. We charge four credits per hour. Credit cost is about \$1. So when you go ahead, and we don't round up or anything. So for example, if you were to go in, and process 100 DWGs, and that ended up being one credit, then when you got to one credit, we would deduct a credit from you. So when you start off, you get the free trial, you get 500 credits to use. Data Management API includes 500 gigs of storage, if you want to store stuff on Autodesk. Just raw storage, that's what we call our object storage. If you're storing it, obviously, in the SaaS apps, it's included with whatever storage you have in your SaaS apps. So you're included with that. If you want to use the design automation API, it's four credits per hour.

If you want to use the Model Derivative API, we split that up by format. So if you're doing a big building model, a big Revit model, we charge you one and a half credits to process that. And once you process it, you get full access to all that data. So you get access to all the graphics, the drawings. So if you had to upload a Revit model. You know, it's got a big model. It's got you know, 500 sheets of drawings, it's got all kinds of metadata, you process that, you have access to all that data, as many times you want. It's sitting up there in a cloud storage for you, for as long as you need it. And you can use the viewer to access that data, if you want. Or you can just go get access to it, and download it, and do whatever you need to do with it.

If you've got some more simple files, like DWG files, or you know, small mechanical files, things like that, those are \$0.20 to process. And again, once you get to a point where you get to a single credit, we'll deduct those from the credit line. To start out with you can start with our free trial, like I said, which includes 500 credits, and five gigs of storage. First subscription offering right now we're offering it as a monthly subscription. It's \$500 a month. It includes 500 credits that you can use with any of the APIs. And as you consume those credits we'll report back to you, you know, what you're consuming.

It's a great place to start. I would say, probably in about six months time, we're going to offer the ability to consume more than that. I'd say the biggest guidance I can give you right now is start with the trial, try it out, move over to subscription if you want to start using it for any of your ongoing needs, when you run out of credits on the trial side. And then just use it. And if you start using too much, if we decide you're using too much, we'll give you a call, and just talk about what you're doing. But you know, the reality is we want to give you guys some runway over the next six months or so to try out the APIs, figure out what your usage is going to be, and then probably mid next year we'll get to a point where we start talking about how you can

buy additional credits, and consume more than you have. But you know, we'll give you some runway to work with over the next six months or so.

So try it for free right now. Subscribe for \$500 a month as you kind of get going beyond the trial usage, and that's sort of the model that we're doing. As we add new APIs, they'll just have additional prices for those, rights? So you won't pay more subscription dollars. You won't have to do any of that. We'll just add APIs. As you use those APIs you'll just get charged for using those particular APIs. So it's all based on consumption.

And what's the next slide after--

**SHAWN** Q and A, wasn't it?

**GILMOUR:**

**STEPHEN** Yeah, Q and A. Questions?

**PRESTON:**

**AUDIENCE:** Canida date?

**SHAWN** Not a Canada Date. A Canadian store hasn't launched yet. So soon. Soon. So if you're in a  
**GILMOUR:** country like Canada right now you can start with the trial, and then move on to the subscription. So you're coming down the road.

**AUDIENCE:** Is the media regionalized? So let's say, [INAUDIBLE]

**SHAWN** Good questions. So the question, in case you didn't hear it, is where do we actually store  
**GILMOUR:** information? Is that regionalized? So today that information is east and west coast, on the US. We're spinning up our Ireland data center right now. We've got several of the services in there right now. So that's going to be sort of our next level of investment. With our ETA on having most of the stuff in Ireland? I know right now we have storage there.

**AUDIENCE:** Storage in Ireland [INAUDIBLE] Forge [INAUDIBLE] tell me about the production in [INAUDIBLE] I don't know if we're-- we're [INAUDIBLE].

**SHAWN** Yeah.

**GILMOUR:**

**AUDIENCE:** [INAUDIBLE]

**SHAWN** Yeah. So shortly we'll have Ireland. Those are probably the ones we're going to work with for a while. Where we're currently-- you know, we don't have sort of our phase for spinning up an APAC yet, but those are the ones we've been working with a while. The way the data works as well is if you start data off here in the US, it will always reside here in the US. If you start data off in Amia, it will always reside in Amia. So we track kind of where it's going, to things that we're doing.

**AUDIENCE:** Do you have a region that is [INAUDIBLE] to you, or did you start in one region, and then migrate to another region [INAUDIBLE] But did you have a region that started on the maybe east coast, or west coast, [INAUDIBLE]?

**SHAWN** Yeah, and it depends on what you're doing too. Like for example, if you're doing things like viewing files, right, you know, we do caching and stuff for that kind of stuff. So that's a little bit different. It's just the source data that we're doing east, west coast, and Amia right now.

**BEN COCHRAN:** I have a question. This sounds great. How can I learn more? There's a few different ways. One of course is visit the developer portal or Forge. [developer.autodesk.com](https://developer.autodesk.com), that will also give you access to our Git repository, and all of the API documentation. Also in June we're hosting our second Devcon which, last year, we had over, I think, 1700 developers, and innovators come to San Francisco. And it's really it's amazing. You said downstairs, there's 100,000 people in the audience. And this is gigantic. DevCon is really one on one intimate conversation with people who are making Forge, and the people working with Forge. So definitely there's some information in your seats. Definitely stop by the booth downstairs to see more of these demos, and more in-depth. You can also ask us questions at [autodeskforge](https://twitter.com/autodeskforge) on Twitter. And Nelly, also if you're interested in receiving more information, we'll scan your badge you can sign up for Forge Developer Newsletter.

**SHAWN** Yeah, I can't stress enough the opportunity on DevCon. It's literally down the street from the Autodesk office, where the guys, unlike me-- I don't write code-- the guys who are actually writing all the code for Forge kind of live and breathe. So they all come down to that event as well. So you know, you don't just get access to guys like me and Ben who are trying to manage the strategy and the architecture. You get access to the guys who actually write the code too. So it's a great place to meet and network with other people that are working on developing things, as well as network with some of the people that are actually writing the code for Forge as well. Other questions?

**STEPHEN** There's one. Over there.

**PRESTON:**

**SHAWN** There. Sorry.

**GILMOUR:**

**AUDIENCE:** So once I have a \$500 a month subscription, I can unlimited viewers?

**SHAWN** So great question. If you have a subscription, and let's say you've taken a Revit model, and  
**GILMOUR:** created-- how do you get access to that data? What about the viewing data? Yeah, so we don't charge for you using the viewer, or writing applications on top of the viewer. When you get a subscription you get the right to use that viewer with any of the data you generate with Forge. So if you've generated the data through the model derivative API, and you're on subscription., you can basically use that viewer as much as you want.

**AUDIENCE:** [INAUDIBLE] third party [INAUDIBLE].

**SHAWN** Yeah, so if you look at the site there's about 65 formats up there. So yeah, Catia, SolidWorks,  
**GILMOUR:** NX. There's a bunch of different formats up there that you can actually use it with.

**AUDIENCE:** [INAUDIBLE] have to use the derivative first?

**SHAWN** Yeah, you've got to use the derivative first. So you take this all, works file, upload it. We'll turn  
**GILMOUR:** it into an SBF file the viewer can read, or an F2D file if it's 2D information. These are all the formats that's Stephen's scrolling through here. And then once you've got it in that format, the viewer can then go understand that file, and allow you to view it. Sorry, there was another question from the gentleman. OK. Other questions.

**AUDIENCE:** Is the [INAUDIBLE] guys on the road map?

**SHAWN** Yeah, so the question was, [INAUDIBLE] here, was is the Inventor Design Automation now in  
**GILMOUR:** the roadmap? Yeah. They're working on that right now. Matter of fact, if you go to threadmodel.com, threadmodeller, I think it is actually, dot com, they're one of the private betas. And they sort have done the first little test app, I would call it. And so what they've done in threadmodeller.com is they have an Inventor application that takes the-- if you know much about Inventor, when you do threads it basically puts a bitmap, you know, on the actual model for where the threads are, because they're trying to save, basically, memory, instead of trying to model threads. But if you actually want to model the threads, they have an application that

will go in, and take that bitmap, and, turn it into the actual threads that they represent.

So what they've done is they've created an application where you can go in, and drop an Inventor model in there, and it will read that information from bitmap, and actually generate the physical threads on the model. So it's more just an example to show how, you know, the progression of being able to write an application on a web based Inventor, and make it do something. But yeah, that one's currently under development. It's in private beta right now. If you're interested in the private beta, let me know, and I can pass it on to the guys that are running it.

**STEPHEN** I think their site's down, or the network's just gone down. One of the two.

**PRESTON:**

**SHAWN** I can't remember if it's thread--

**GILMOUR:**

**STEPHEN** It is that. It's definitely that.

**PRESTON:**

**SHAWN** Yeah. OK.

**GILMOUR:**

**STEPHEN** It's not working at the moment.

**PRESTON:**

**SHAWN** OK. Other questions?

**GILMOUR:**

**AUDIENCE:** You mentioned the Inventor API. Is there any sort of thoughts to do the Fusion API, as well?

**SHAWN** Yeah, absolutely. Absolutely. So you saw Steven Hooper this morning, if you saw the main presentation. They were talking about the web based Fusion. So underneath that is a web service for Fusion. So that will be one of the other ones we'll be working on too, is adding that to that Design Automation API. I think that one has a little bit more potential, because that one we could potentially have interactive kind of stuff going with that one. So we're still working on exactly what that one's going to look like. But yeah, that's another one. Other questions?

**AUDIENCE:** Sorry about that. Is there a limit to how much data you can view in the viewer?

**SHAWN** Is there a limit to how much data you can view in the viewer? How much data do you need to

**GILMOUR:** view? Why don't I ask that question?

**AUDIENCE:** Anywhere from 30 to 60 million polygons.

**SHAWN** 30 to 60 million polygons.

**GILMOUR:**

**AUDIENCE:** That's what we had in VRED today.

**SHAWN** Yeah a polygon count, I don't. I've seen 2 million polygons images that come out of the Recap

**GILMOUR:** API in there. I don't know about polygon count. We typically deal in megabyte count. Like I've got to I've got a 900 megabyte Revit model in there, for example. You know, I've got 500 megabyte Inventor models in there. So I haven't done a polygon count, so I tend to go--

**AUDIENCE:** [INAUDIBLE].

**SHAWN** Sorry?

**GILMOUR:**

**AUDIENCE:** Two or three gigabyte VRED files.

**SHAWN** Today, I don't think we support VRED files. So that's--

**GILMOUR:**

**AUDIENCE:** That sounds large to me. And there is a limit, right? I mean, the limit we usually run into [INAUDIBLE]

**SHAWN** Browser memory.

**GILMOUR:**

**AUDIENCE:** And yeah, so we have to look at [INAUDIBLE] it's not a one to one correlation [INAUDIBLE] we have to look t that [INAUDIBLE]. But the models we've loaded are [INAUDIBLE] sizable models. [INAUDIBLE]

**STEPHEN** So we've ran out of time now. So one more quick question, and we're going to have to stop.

**PRESTON:**

**AUDIENCE:** Just didn't catch it FBX, support?

**STEPHEN** We do suport FBX.

**PRESTON:**

**SHAWN** Yes.

**GILMOUR:**

**STEPHEN** OK. OK. So we are out of time. Please do come and say hi at the Forge booth. Sign up for  
**PRESTON:** notification about the conference, if you want to receive our newsletters. Thank you  
everybody. Thank you.