AARON VORWERK: OK.

AP PERCOWYCZ: All right.

AARON VORWERK: Cool. Hi, guys. Good morning.

AP PERCOWYCZ: Good morning, everyone.

AARON VORWERK: Last day of AU. Hopefully you all have had a good week so far. Hopefully you are still awake after last night. We're going to be getting into, obviously, BIM 360 Team and Collaboration for Revit, today. So before we introduce ourselves, let me just ask, for whom is this the first C4R class of the week? OK. So most of you are familiar with it. Who has been using C4R in their firm? OK. Great. Cool. So this will be, this will be review for most of you. Maybe you'll pick up a few new things. Or maybe it's just a better all-around picture of what the solution does.

My name's Aaron. You can see the names on the screen. I'm a registered architect. Also a civil structural engineer by background, out of Fort Worth, Texas. I've been with Autodesk for going on four years now. I'm a subject matter expert around buildings, which just means that I come out of that industry. I've got my 10,000 hours implementing Revit in a couple of firms, did consulting for about five years, and came over to Autodesk. And then with me is AP Percowycz, off of our same team. I let him introduce himself.

AP PERCOWYCZ: Yeah. So as Aaron said, AP Percowycz, also a technical specialist with Autodesk. And my background is in architecture, as well. So although I didn't necessarily use C4R in practice, a lot of its principles, its application, directly applicable. So yeah, excited to be jumping in with it, you guys, with you guys.

AARON VORWERK: Didn't use in practice-- extremely jealous of those living in this time-- that's the way I would put it.

AP PERCOWYCZ: Absolutely.

AARON VORWERK: So I'll start with some slideware, but not bore you to death with it. And then we'll switch over to AP showing some BIM 360 Team. We'll switch back to kind of introduce the topic of C4R

Collaboration for Revit, a little more deeply. And then I'll show some Revit action. And then we'll get you on your way. This is going to be fast because we've got a lot to cover in 60 minutes. 60 minutes, right?

AP PERCOWYCZ: Yup.

AARON VORWERK: OK. So you've seen the class summary online. I'm not going to bore you with that. But really, this is about Team. We'll talk a little bit about A 360 becoming BIM 360 Team, and so on. Talk a little bit about the history of Collaboration. It might be review, but we'll do that quickly. Let's jump in. There we go.

This is slow. I'm going to do it the old fashioned way. So BIM 360 Team. We have a BIM 360 platform now. And for those who haven't been following along, we've been buying things along the way, building things along the way. They've been a disparate collection. So we started out with Field and Glue. As many of you may know, years ago, Vela Systems, Horizontal Glue became our first two products on the BIM 360 platform.

We've been adding other products that we've either built-- Point Layout was an application we bought called Get the Point. BIM 360 Docs, we've just built. BIM 360 Team has a long history, we'll talk about in a second. Building Ops on the back end is something we've built recently, a very cool application for pushing straight out into the hands of an owner.

And we see BIM 360 Team as the entry point. We're going to talk a little bit about why that is and how it works for us. We'll show a little bit of that. But this is where we all come together early on. And my argument would be that BIM 360, as a platform, which is now becoming one backbone of products that all have been rebuilt to work together, is not really a BIM 360, is not a, it didn't really represent the full breadth of BIM until we had BIM 360 Team.

Because it was really a pre-construction through hand-over platform, if we're honest. And that kind of ignores the entire design process, right? So again, we'll go through what BIM 360 Team is, and how it helps us. But you know, we have this evolution that's happened. And if you're kind of following along with this, you know, we started with Autodesk 360 a number of years ago, which is kind of like the Facebook of Autodesk, of file sharing, right?

So very similar to Box, Dropbox, except it was able to understand and view many more files than those generic solutions because they are, in fact, generic solutions. It's just that some of the social sharing stuff and the organization stuff wasn't there that really needed to centralize

our projects or organize our data around projects. So Autodesk 360 rebranded as A360. The A360 free version was really the same old thing, except that for it had a nicer viewer, the large model viewer, as many of you are aware.

And then we introduced A360 Team. A360 Team being the first time that Autodesk had a cloud-first solution, if you don't consider Buzzsaw like to be a cloud-first, but more like cloud-enabled. So the first time we had a cloud-first solution that was project-centric. And so now we have this thing that's, OK, so A360 Team signifies that Autodesk might be getting into the project management or organization space, a little bit. Not about the financials of the project, obviously, but around organizing the data around a project, especially the models.

A360 Team has matured quite a bit over the last year, but because of the fact that we are a broad company, we've split that, right, into BIM 360 Team and Fusion Team. The manufacturing folks need tools that are specifically geared towards manufacturing. And likewise, those of us in the AEC industry need stuff that's less generic and more focused around AEC.

So one of the catches, or things we've had to explain over the years is, OK, well I have all this stuff at A360 Team. I have BIM 360 Glue and whatever that my contractor is using. You know, how are we doing this on two different platforms? Does this make sense? The truth is, as you may have been hearing in the keynotes, and so on, we've been building this common data environment in the background. And really, all of that stuff lives in the same place.

So for us to go from A360 Team to BIM 360 Team is a rebranding exercise because the files already live together. And as you will see, as was mentioned in the keynotes, all of that will just sort of flow as this BIM 360 platform is really realized. And that's the advantage to that is, of course, we can design. We can connect with each other so easily with tools like Collaboration for Revit on the front end, if that's our focus. But then we don't have to really do anything to push it on downstream into pre-construction and construction. And that's where the real power is, that we're connecting the whole lifecycle.

So yes, we can share files, view them, search them. This slide's been up for a little while. I don't want to gloss over it too much because it's over 100 file formats, right? So we might be able to do that with three or four or five file formats. You know, I'm not knocking on a solution like Box, right? It's awesome for the one thing that it does well. We even have a corporate box account, right?

But it doesn't understand what a design file is, what the structure of that file is, how to get into the innards of that file-- and some of the stuff that AP is going to be showing in a minute-- comparing design changes over time. That's just something that a generic service isn't built to understand. It's not really it's mission.

Now some of the highlights, right? It's project-centric, as I mentioned. We have this Live Review feature we'll play with in a little bit. It is the most extensive 2D and 3D viewer in the business. It is awesome. I mean, I'm coming from the old timers' world a little bit, in the sense that for us to even open a satellite office down the street was a major hassle. What are we, going to run disks back and forth? Or pay a huge amount of money to run a T1 line from office to office? Some of you don't even know what a T1 line is.

But there was no solution that just allowed me to go home or go to Chick-fil-A and log in and just work on a Revit model. That was-- I'm in, I'm in Texas. So I could not do that. And now it's trivial, right? And I can be the client with my feet up on the desk at 4:30 in the afternoon on an iPad, spinning around a 1-gig model in a browser on an app. That's sweet. Like that completely changes the nature of the relationship with the client. Completely. If you're willing to teach them the three buttons and allow them to mark up your designs through the app.

Built for Distributed Teams, obviously, design markup, these are features that we'll get into in more detail. Again, it's in any format, whether it's ours or somebody else's. Right? And depending on the intelligence of that native format, there's more things you will be able to see, or less. Right? In an AutoCAD file, even if it's well attributed, it's going to be less data than what I get out of a Revit file. The same thing would apply to third party formats. Generic formats are going to be generic. Intelligent formats or proprietary formats are going to be more intelligent.

On any device, that's just the way it works now. So without further, you know, explanation of that, I want to jump in and have AP just show it. This is BIM 360 Team.

AP PERCOWYCZ: Absolutely. Thanks, Aaron. All right, guys. Just to reiterate some of the things Aaron mentioned early on. Really, the way I look at BIM 360 Team at a high level is a Box or Dropbox-like service where you can obviously save a lot of your data, put it in a platform that you can enable the extended team to basically access.

One of the biggest advantages for it, as well, in my opinion is it kind of serves like a Facebook page for a project, as well. It allows you to basically comment, collaborate, set up these live

environments that we'll obviously go through. So for a lot of you, this may be review. But nonetheless, at this point, I'm just in BIM 360 Team, the main hub, if you will.

And what a hub basically is is, again, a location where your project structure is all housed. So at the top, you guys see Team Skyscraper, International Autodesk Hub. This is our internal hub where technical guys like Aaron or myself basically just set up demo projects. Nonetheless, right, the main focus here-- I don't have access to every project involved here. So even in an architecture firm or in an extended team environment, you may have access to be able to see a lot of projects up there, but you obviously need to be invited in specifically as a user to gain that access.

So if you're worried about controlling who is going to have access to what project, this is just the first stopgap in that process. So I have the ability to request access if needed, but nonetheless, let's just focus on projects that are obviously shared with me. So these are, again, all projects that I've already been invited to. And for the sake of our discussions today, we're going to be focusing in on this as Autobahn project.

AARON VORWERK: Hey, AP, just to remind people about that hub and project concept. So you may be showing a little bit more of that later with consultants, but for those of you that don't know, you know, it's going to be myfirmname.autodesk360.com is the hub that should be granted if you're on-team. Right? We obviously have at least 195 hubs, so inside Autodesk, we've been playing with it a little bit.

But you'll have this hub. And then you'll host your own projects. But if you're not the prime, like if you're a consultant to somebody else on 90% your work-- so let's say you're a structural engineer and you're working with your favorite architect-- they're going to have a hub and you're probably invited to projects on their hub, as is the case with what AP just said. He doesn't own the Autodesk 195 hub, but he's been invited to participate in projects on that hub.

AP PERCOWYCZ: Absolutely. So now that I'm in my specific project, right, I can see a very similar folder structure to any local drive, even a Box-like service, again. So I can fully customize these out, adding folders in, whatever structure really makes sense for your specific firm, totally able to set up in this environment. And here you see things like just specific folder structures. You know, I have my 100% CD set. I can house things like DWGs in here, you know, all listed out. I have the ability to actually jump into them and view the file itself.

And really, for me, this is one of the biggest advantages in this tool set is that, again, when we talk about people outside of a company, not everybody necessarily has access to a common data structure. Some people may have AutoCAD, some may not. But they still need to be able to view data at certain times. This just really enables that process to be able to go in and view, see what's actually going on in that data structure.

So I'm just going to pop back out. Obviously, I have the ability to house things like PDFs, as well. Same idea applies, just the ability to view those who go in, see what's going on in my data structure. But for me really, the biggest advantage in using BIM 360 Team, obviously being able to store that data up is important. But we talk about a BIM environment and a Revit workflow environment.

Again, that typical circumstance with, maybe I'm working with an owner, that I still want to be able to view my project. But they don't necessarily want to have to buy Revit. That's a big expense. They just want to be able to view, comment, see where the design is at any given time. Again, for me, this is the biggest advantage of BIM 360 Team is that we have the ability to natively view these data structures, specifically Revit in this environment.

So we have a full, large model viewer that, from an editing perspective, I can't make changes. But nonetheless, I am able to navigate around my project as needed. You know, it's pretty fluid in this environment, just being able to navigate around wherever I need in my project. Also, I have the ability to add things like sections. So if I have to look at the interior of my projects, you know, I can very easily cut a section in my model, easily navigate into whatever area of my floor plan that I want to add comments to. Maybe in this specific example I want to take a look at this table, of the room lay out. I have the full ability to basically look in at any object properties associated with this model, as well.

So here if I select in on things-- and wouldn't you know it-- it's not popping up for right now. But nonetheless, if I do select in on objects, it does bring up that property tree, typically. For some reason, it might be lagging out with the internet. But nonetheless, full ability to add comments, as well. This is one of the bigger advantages here is that I can add a comment to a specific point in the model, or even on a specific object.

So if I pick a point, again, if I'm focusing in on this room, it's going to recognize that point in space. And from here, I can direct this either project-wide-- just have it as a broad-based comment-- or I can even direct this at a specific user. So here, Aaron-- apologies for

spamming you here-- but if I want to go ahead and direct this at Aaron, say, you know, let's look at this door hardware. Basically post it up.

AARON VORWERK: Remember when live demos in the cloud were scary?

AP PERCOWYCZ: But nonetheless, right, when I add that comment, again, no matter where I navigate, in or out of this model, that comment is going to stay contingent to that point in space. And here it looks like I didn't actually select on that door, so. Nonetheless, though, I can also view all the comments that are associated with this project. Here's another one that Aaron actually added up, which is just basically a red line markup at one specific room.

So again, just enabling a tool set that allows you to share information a lot quicker amongst the extended team and a common shared environment. So again, just relaying of information, providing clarity of what design intent, and extending it out to, again, users that may or may not have access to Revit in that environment. So let me just back on out here.

There's a couple of other features with BIM 360 Team that just lit up in the last couple of weeks that, personally, I'm pretty excited about. And first and foremost, I'll just pop back into this model. What you guys will notice is that I'm now on Version 7 of this model, in the upper part of the screen here. If I select in on my versions, I have a full listing out of my history of this model.

So any publishes that have been made from Collaboration for Revit-- Aaron's going to go through that in a little bit-- are all going to be listed out here. So when we think about a workflow in a working environment, I don't necessarily want an owner or outside consultant seeing my live, active model, changes that are being made that may or may not be at a state that, you know, they're ready to review. So at this point, I can basically choose what I publish, and thereby, you know, replace my version as needed.

One of the features that just came onboard was the ability to compare versions of this specific model. So if I select in on Compare, it's basically going to launch open another screen that allows me to compare these models together. Usually it takes about a minute or so to load up. I'm just going to pop over to this environment where I've already had it set up. At the top, you guys can see that I'm comparing Version 7 versus Version 3.

You know, at a standard environment, right, nothing's really jumping out at everybody. But I do

have the ability to click on this Overlay feature. Basically what this brings up is it is absolutely comparing those two models with each other. And it's giving me a readout of all the changes that have occurred in the version over version of this model. So from Version 7 to Version 3, I can see that four elements have been added, nine have been removed, eight have been modified, and they're all listed out in this little dashboard.

I can also filter these out by elements or by disciplines if I need to. So I can choose to hide electrical, plumbing. I can hide the mechanical. Obviously in this case, most of the changes that I'm showing are all on the architectural side of things. But if I zoom into this environment, I can see that the four elements that have been added-- if I select in on them-- I can see that this is a piece of case work, a double drawer that's been added, elements that have been removed.

It looks like this is just a window element that was probably placed in the wrong location, just wanted to clean up. Can see that I've also added a sink mop to a specific space that's been part of my design. Can also see that part of the room layout has changed. So these walls are lighting up as elements that have been modified. So when I select in on them, I can see that the changes between 3 and 7, there's been an area change. The length has been moved by one foot of this wall. And the volume has increased by, obviously, its calculation.

AARON VORWERK: AP, the significance of that, just right there, is that this is not just letting you know, hey, something's different. It's letting you know, hey, maybe the estimate has changed by this amount. Right?

AP PERCOWYCZ: Yes.

AARON VORWERK: So you can see where the potential of this goes in the future.

AP PERCOWYCZ: Right. Right. When we talk about a workflow environment, one of the biggest things I always struggle with, dealing with even outside consultants, or even sometimes members of my team, is tracking down exactly what has changed in a model. Oftentimes, you're contingent, you're relying on them to relay that information, either communicating, or maybe clouding that drawing and figuring out what's changed.

So as long as you're publishing the versions over version, it really enables that, you know, stops those times where things might just fall through the cracks. I have the absolute data

structure where I can see exactly what's been modified, thereby, you know, mitigating those times where I might miss information.

AARON VORWERK: Let me ask, who is familiar with Docs? Only a couple folks have tried it. OK. So in Docs, you have almost like a virtual light table where you can lay over drawings, version to version, and see how things have changed, right? It's about document management. This, you know, conversely, is about comparing those models at different stages before you even have documents, potentially. Right? So they have different functionalities at different stages in the process.

AP PERCOWYCZ: Yup. Absolutely. And there guys, look, I got the properties. It worked this time, so.

AUDIENCE: [INAUDIBLE].

AP PERCOWYCZ: I'm sorry?

AUDIENCE: Click the version 3 button, is that--

AP PERCOWYCZ: The question is to switch to a different version. Is that what you're saying?

AUDIENCE: [INAUDIBLE] would you be able to see the changes?

AP PERCOWYCZ: So at this point, it's just showing me what elements have been modified. It's not going to actually isolate out that specific version in this environment.

AARON VORWERK: I think it's just choosing which is your model that you're looking at in the viewer right now. Is it 3 or 7?

AP PERCOWYCZ: Yep. Exactly. Also one of the other features associated with Team, when we talk about, again, a working environment, that common area for people to collaborate. This is a brand new feature as well. It is really the ability to live share, live review models within this environment. So I'm just going to switch screens over for point of reference, everybody.

This is now Aaron's screen on display.

AARON VORWERK: I'm not driving.

AP PERCOWYCZ: Aaron is not driving. But in this live environment, you guys can see on the right hand side, I'm the host. Aaron is also in there. We have the ability to add comments in this environment. But

as you can see, as I navigate around this model--

AARON VORWERK: You'll see that AP's little image there is red. So he's the red dot. You can have a bunch of people in here with different colored dots. He's driving at the moment. We're all reviewing together on one shared view.

AP PERCOWYCZ: Exactly. So we talk about having to share information effectively. Maybe you're on a conference call. Whatever the case may be, really just allowing this environment where we can isolate in on specific areas, specific elements, convey changes that need to be made. Going through design review becomes a lot easier across an extended team when you're not always in the same location. So that's one feature I think we're all very excited about. On top of the model, compare, really just enabling access to that data. Yeah. That's most of the ins and outs of BIM 360 Team.

AARON VORWERK: All right. Let me jump back to the slide show and see how this works. C4R. OK. So good stuff there. And I'll maybe reiterate this if we have time at the end. But being that Team is free for most people, and low cost to others-- included with C4R, so not even a question when you're talking about those folks-- you know, it's a pretty good deal given that you get these amazing features that are not limited to just Revit, but to I think 110 or so formats at the moment.

So Collaboration for Revit. What is it? Why do we have it? What's significant about it? Maybe my battery is dying. I like to talk about the evolution. You may have seen this slide before if you've been in other C4R-focused talks. But the world I grew up in was, you know, like the Revit of 2005 was a very different animal in terms of collaboration. So we had work sharing back then. Work sharing has been around for 15 years, despite what other folks or other vendors might say. We've had that for a long time. And it's been very good.

But it was limited to one office and it didn't really track anything. You know, you may run the work sharing monitor still today, or many years ago you may have used Bluestreak when that existed. Those are outside apps running, right? So either as add-ins or as external applications that were telling us a little bit about what the model was doing. But it really didn't track it very well in Revit. You know, work share display settings didn't exist back then, right? So you couldn't really see what somebody else was doing in the model, even in that regard.

And of course, it was within one office-- excuse me-- within one office. And you know, it was really dependent on folks to make sure their local files were refreshed at regular intervals, and they behaved correctly with respect to the central file. In other words, they stayed out of it.

Things like that. And so that was where we started.

And then, gosh, like seven years ago now, we rolled out Revit Server. Now Revit server in its idea is actually very good. And we gave this software away. But for those of you that have-- who has familiarity with Revit Server? OK. So you know that I'm not telling the full story when I say that. The software is free. The hardware requirements to run it is anything but.

And most small to medium sized firms, let's say, don't have a spare server in every office, or even virtual server space and a spare copy of Windows Server laying around to be able to set up Revit Server. And even if they did, and they set it up beautifully, then it's completely dependent on the speed of their connection between their offices as to whether it's going to work well. And so that then sometimes necessitates third party WAN acceleration solutions, and so on.

So this sounds very expensive, and it is, for the small to mid-sized firm. However, a lot of the mid to upper sized firms have been using Revit Server for years because they overcame that end. It was a way for them to collaborate across multiple locations. Now the limit to that still was that it was designed for use within a single domain. In other words, in a single firm across multiple offices. So if you wanted to break and go beyond that, now you're talking about using VPN tunneling or other methods to make it possible for other firms to share with you.

All of that really technical stuff meant that you had to have IT expertise in-house, or pay a bunch of money to somebody else to do it. You had to maintain that solution. Some firms are still doing this heavily today because they already have the infrastructure and thousands of projects worldwide sitting on Revit server. So it works, but there's obviously some limitations there that really kept a lot of the small to mid-sized firms, especially, out of the game. OK?

And even then, like unless you were so sophisticated-- as a few of our customers are-- that they would put a Revit Server Accelerator on their laptops so they could go out to the field or go to Starbucks and work, unless you were at that extreme end, you still didn't have that ability to go home and work on a connected Revit file, or go to the job site, or go to the client's office and work in a connected Revit environment. So we needed a solution to address that, and that's obviously what we're trying to do with Collaboration for Revit.

So I'll get into the mechanics a little bit more. But for those who don't understand this fully yet, who have not heard this stuff yet, Collaboration for Revit is not Revit in the cloud. We can do

that too. But this is not Revit in the cloud. This is your models living in the cloud. This is being able to access them with an A360 login from anywhere, on even a slow network. And I'll talk a little bit more about how that works. We can prove that right here.

So you know, any conference is very hard for them to keep up with the bandwidth that we want. And so we can we can always test it on WiFi. So obviously, multi-firm concurrent authoring, even multi-location-- obviously within a firm, concurrent authoring, that's kind of a given-- is one of the key benefits, right? We want to be able to just work from anywhere, with anybody. That doesn't mean we're all living in the same model. You can do that. But the general Revit collaboration practices still apply, especially because contracts, scopes, and liabilities typically dictate that more than the technology.

This is like the most technical slide I'll show. So it's not technical at all, really. But I wanted to explain what's, why this works well at a high level. OK? So the right side models are living in the cloud. We get that, yeah? They're living on Amazon Web Services. We engage with them, like we have an interface, obviously, in Collaboration for Revit that's engaging with AWS.

But back on this side, there is some magic happening on the local user's machine as well. So instead of the traditional local file that you see when you're doing work sharing, you know, with the username appended to it and so on, that's all kind of quietly managed now. And there's a file that doesn't, is not recognizable as a Revit file or a journal file sitting in the user data cache. So it's a text file that's roughly the size of a Revit model, OK? Big text file.

And that is the local cache, the one you see on the bottom of the screen. And then there's a bunch of delta caches that appear, small files that appear all the time and kind of come and go in that same place. What's actually happening is that every time a user is making a change anywhere-- so AP is in Denver most of the time-- and so AP is making a change on his file. And one of my other colleagues is in London. So they're making change in their file.

Before they've ever seen it, but you know, they moved that wall or whatever, there's a little blip that goes across the server to my machine that says, hey, there's a potential change here that involves moving that wall. And there's a potential change with whatever AP's doing to my model. So I've got a bunch of little stuff that might happen, sitting as a delta cache file on my machine.

So what does that mean? That means that when they choose to sync, it just flags those files as, hey, those are actually going to commit. Those are actually going to be legit changes. And

when I sync, I'm actually syncing locally with all that data. I'm not reliant on the cloud for speed, right? Because the delta changes are already sitting in my computer. Unless we're all trying to change everything at the same time and sync at the same time. So you still have to kind of coordinate your syncs a little bit.

But that means that this connection right in here doesn't have to be awesome. Right? So a 2 gigabit per second connection-- 2 gigabit-- 2 megabit per second connection speed is really the minimum acceptable threshold to not notice the slowdown. And that's not fast. I mean, that's hey, I'm having a problem with my internet connection at work. So I'll just tether. Right? That's fine on LTE, even 4G. So that's reasonable performance, even on the job site, is what that means.

Now I mean, at home, I have 100 megabit per second dedicated connection. So I mean, most of us will have far more than that. Anything above a dedicated 8 megabit per second, per user, both ways-- I've been told-- is just overkill anyway, because there's a certain transaction time it takes with Amazon. And you know, big firms will generally be able to accommodate even the upper threshold there. So for most of us, we're going to get good performance at Starbucks or at Chick-fil-A, you know. So it's really a, it's really an impressive solution from that perspective.

And the other thing is-- when I'm in Revit I'll show this-- you're not worried about local files, central files, all that terminology anymore. It's all managed by the service. In fact, it's easier than the normal collaboration process, to the point where a lot of firms have been asking us, hey, can we just do that in regular Revit work sharing? We don't want to tell users to create a new local file every day. We want it to just do that stuff. And so our developers are looking at that, too.

I could put an asterisk on this one, maybe. Because you still have to be able to, you still have to be able to install the Revit updates and go into Autodesk accounts and tell users that their provision for the service. But you will never have to walk over to your server closet to make this stuff work. And that's very significant. I mean, not only when I talk about ROI for Collaboration for Revit, I ignore the costs of maintaining servers, which is a huge cost for any firm, other than the small firm that's got a NAS box in the corner, and that's all they've got. Question?

AUDIENCE: Those local cache files, they're all link models within the project, like a cache file appears on the server?

AARON VORWERK: The question was whether local cache files include link models, and so on. There will be cached information about the linked models sitting locally as well. Yes. The caches will get big. That is something to watch. If you skimp out on hard drive space, you'll notice that with a lot of C4R usage. That's a good question. Yes?

AUDIENCE: That networks thing you mentioned, that's per user?

AARON VORWERK: Yes, that is. Now of course, there's-- this is presuming that everybody would be syncing at once, you would want that. So when you get to 100 users, you obviously don't need, you know, 8 times symmetric, times 100 users. You don't need 800 megabit per second connection to maintain top speed because obviously there's a staggering there.

I will say, for very large projects-- and we've had some customers doing crazy large projects-- you do need to schedule syncs. You know, when you have 18 users in one model and you have 45 models, which we've seen, then you know, you need to kind of plan a little bit. Because that's intense. Yes?

AUDIENCE: How about latency?

AARON VORWERK: Latency is-- that's one of the things we're solving here, right, is the fact that we're not doing it all live. So the question's about latency. Revit Server has always been very susceptible to latency because of the round trip time. In the case of this, because we're a little more disconnected-- we're staggering some information locally-- latency is not a key concern.

High latency, you might notice a little bit of lag. But not so much. Yes?

AUDIENCE: [INAUDIBLE]

AARON VORWERK: Currently we're-- yeah. So currently-- question about where the servers are located. Currently, Amazon AWS East and West are primary servers. And we're-- I don't know if this is public yet-- we are standing up a, so if you haven't heard this already, we're standing up a server right now in Ireland. So that will be live, if it's not live now, it'll be live in the next couple of weeks.

Others are in discussion. But right now, everything's hosted in, you know, the most, one of the largest, the most secure-- in northern Virginia-- is AWS East. I could get into, if we have time at the end of the session, I can tell you exactly how large that facility is. But it's obviously a very secure location, close to DC. And then we added the West server because of the high, very high usage on the West Coast of the service. And that reduces latency of our service.

We can come back to these questions more. I want to--

AP PERCOWYCZ: We have one more in back.

AARON VORWERK: OK. One more.

AUDIENCE: One location for Europe and [INAUDIBLE].

AARON VORWERK: Yeah. As I said, for now we're standing up one in Ireland right now. But others are still negotiating. One more.

AUDIENCE: [INAUDIBLE] hosted on all the servers? So if a team is in East Coast and West Coast, are they actually using the same server or different servers?

AARON VORWERK: OK. Last thing I'll say about server data centers before we move on. But AWS East, for example, is at least six data centers connected by multi-terabit hard lines with more than 50,000 servers per location. Whenever a data packet hits an AWS data center, it's immediately blasted all over the place. Amazon developed this infrastructure. In 2006, Amazon was a $7 billion a year business. Every day, they put in that much infrastructure today.

They can support another $7 billion dollar business everyday right now. They are very large. So it's an extremely redundant service when it hits AWS. We also have created multiple stacks now inside of AWS. So if C4R has a major problem that brings it down, we can switch to another stack so people can keep working. So a lot of-- I'll move on. We don't want to get too much in the weeds.

So one thing I want you to just think about it for a minute, this last one is not a today thing, so much as just a, here's what's possible thing. And I mentioned this a minute ago when AP was showing the quantity changes, right, and how that immediately flags me to say, hey, that changes the cost estimate, or that changes my labor factor. I've got to reschedule, reshuffle when the trade shows up in that room. All of that information could start to be automatically processed based on this. Logic can be added, right?

So the same thing. Once our models live in the cloud-- and some people think this is just about access, right? And that's not it. There's big data. There's machine learning. There's processes that right now are very transactional that can be automated. So right now, for example, I want

to do rendering in the cloud. And our rendering service is amazing. I can run 100 concurrent renders at, you know, 4k, and get them all back in 30 minutes to an hour. That's awesome. I can't do that on-- I don't care how much I spend on a local machine-- it's not possible.

But it's transactional. I had to send them there and either go get them, go look at them in Chrome or something, or go download them. That's very transactional. What if it was just scheduled? Or what if they just, the latest 360 degree, stereoscopic panorama was always available? I just, because the services could just run on their own in the cloud. And for example, things could already be parsing into documents on Docs. I didn't actually do anything.

Or they could already be feeding me-- like say an owner is sitting there on their iPad at the end of the day, and they say, OK, well, here's the current cost estimate with x degree of uncertainty based on the quality of the model. And here's the current progress towards lead goal that the same kind of criteria. Here's like, these are bigger questions that can be answered because the data can be processed all the time in the cloud.

We're already doing this with our energy analysis services. If you want to stop me and we'll talk about it later. But we're doing machine learning. We can do predictive analytics because we've run so many millions of simulations at this point. And we write EnergyPlus and we write DOE-2, at this point, for years. And so we're able to tell you, as you're sketching a mass, how that building is going to perform, based-- and what decisions you might want to make-- based on the millions of runs we've done in similar locations in the past, and buildings that have been similar in shape and size.

And so we can do the same thing with these models. All right? So keep that in the back of your mind that once models live there, they live in a place where lots of magic can happen. All right? OK. I'm going to get into Revit and let you add some color commentary. But I'm going to jump into Revit and show a little bit of C4R. Switch over.

Now one of the things I like to make very clear is that-- and this is instructional demo, we call it, but really it's just a guided tour-- so one of the things that is really important for all the Revit users in the room to understand is that C4R doesn't mess with your workflow. It's very minimal intervention, which is like, at one time it's exciting. Then it's kind of like a letdown because C4R doesn't dramatically change my Revit experience. The thing is, it just works.

It's like we went over and flipped this big switch in the corner and now you can share models,

you know, from anywhere. Right? Otherwise, it doesn't ruin or enhance, whatever, your Revit user interface. It's pretty much the same thing. So let me, let me very quickly show some of the changes.

So if I'm going to go open a file-- been open in this one for a while-- yes, yes. OK. So if I'm going to open a file, I now have a BIM 360 Team icon. I didn't have that before. You can go home and check, or fire up your laptop. Right? That's the same. If I go to open a file-- so if I go to BIM 360 Team-- as AP said, it's just, it's kind of like the publish thing. It's only showing me the projects to which I've been invited, or shared with me, on BIM 360 Team that happened to contain Revit models. Those are the only ones that are going to show up. So if you don't have any models there yet it's because you haven't put any there yet and nobody's been there yet.

So if I go into this Audubon 2017-- that's the file I happen to have open, here's the Audubon Arch 2017-- what you'll notice looking at the screen is these Detach From Central and Create New Local options are grayed out. As I said, it's even easier really than the traditional model management process because you don't manage it. C4R does.

And it'll never show some silly user name at the end of it. And in a minute, we're going to show how you can rename files without breaking it for everybody else, and all these things you can't do in normal work sharing. But I could open this file and that's all I would have to do. I'm already in it, so I'll cancel out of that.

AP PERCOWYCZ: And it's to know, too, it's not necessarily any Revit model that's hosted in BIM 360 Team. You can still upload your standard Revit models. Just house them there, almost as a FTP site. These are strictly models that Collaboration for Revit as a service have been enabled on. So it's as easy as enabling work sharing, as you typically would. It's just doing it through the cloud environment. So.

AARON VORWERK: That's exactly right.

AUDIENCE: So next time, when you open the project, you're not going to get that message if you want to put the stamp date to the local model because, obviously, there's no local model, right?

AARON VORWERK: That's right. There is a local model. But C4R will determine-- so the question was, do I get time stamps? Do I get all this information about, hey, your model is not current, or it is current? You will sometimes get a question just saying, you're on an obsolete version of the model. Do you

want to just download a new one? And it will just ditch your cache.

In other cases, it'll look at your model and automatically determine, here are the changes. It updates your model. You don't see any of that. It just opens up.

AUDIENCE: Physically, there's going to be a model in my hardware, in my machine.

AARON VORWERK: It'll be a text file. But yes, there's a model there. It's a cache file deep inside your user data cache. Yup. OK.

AP PERCOWYCZ: Hang on, Aaron. We've got one more.

AARON VORWERK: Oh, sorry.

AUDIENCE: Where are the backups located?

AARON VORWERK: I'm sorry? Where are the backups located? We'll talk about that in a minute. Yeah. Thanks for leading me. The question was about backups. We'll get to that. So to AP's point, I want to show a little bit about how you get the model there. It's very quick. And this one, because it's already there-- if you can see the Work Sets button at the top of the screen-- right to the left of that, I would have a Collaborate button if this button hadn't been shared yet. Right? Or if this model had not been shared yet.

When I click that Collaborate button, it asks me if I want to collaborate locally, which is traditional work sharing. Or if I want to collaborate using the cloud, obviously C4R. Once I've made that decision, if I did it locally, it leaves the collaborate button there hanging out, just in case I change my mind later and want to go to C4R. But once I've gone to C4R, that button goes away and I just have my traditional Work Sets button left because I've already made the decision to go to the cloud.

Now I can do a Save As and dump this off the cloud, immediately remove it from C4R as a detaching process, right? But that would then re-enable that Collaborate button if I decide I want to push that model back up to the cloud. So one good thing about that is that if I did, for some reason, need to pull it off, work sets are all maintained. It doesn't mess up the model. If I push it back up, work sets are maintained. It's not breaking the Revit file. It's just enabling it to be shared on the cloud, or not. Right? Do I want it up there, or do I not want it up there?

Once I've got it up there, everything works as normal. So that Work Sets button, exactly the same as you'd expect. Right? Work Sharing Display settings, down here, turn those on and your-- you have your Control Bar, everything's fine. Right? Shows who's in the file. Nothing's different. That's the magic of it, maybe. Like I said, it could be a little bit of a let down if you're expecting some dramatically different Revit experience. But that's the beauty. It just works. OK?

There are a couple of other buttons that have been added here. So up in the managed models tab, I now have this Publish Settings button. I'll go over that first, which is exactly what AP talked about earlier. Not everything lives on BIM 360 Team. I have to actually publish it out there. And I can choose what I publish.

So I don't want to publish every dirty working view that I've ever made to my owner, right? Like, I don't want them to see that. Or even third party consultants, they should see only a polished version that I've done perfectly, right? So I can choose the views and sheets and so on that I want to send out.

So one beautiful 3-D view that's all clean, and probably my finished sheets, and probably none of my other stuff. Right? And then once I've created that set, I can have lots of sets in here, just like as if I was publishing out to a print out. Right? Once I've got that published settings configured into various sets, I pick the set that I'm interested, save, and that'll be my current published set whenever I choose to publish.

That doesn't actually do the publish. That comes over under Managed Cloud Models. Now Manage Cloud Models, when I first saw this, I thought, why does it kind of look like a browser. That's kind of weird. What's interesting about it is that I don't have to be in the project that I'm actually going to manage. I can be-- so I'm in here and I'm working on Audubon, but I could go into any of my projects and manage all the models kind of without ever opening the Revit file. An interesting concept.

So I'm going to go into Audubon, since that's where we're working today. And I'm going to show what we've got right now, just because that's important. But first things first. So I have a couple of buttons here next to each of these model files. This is a simple one, right, just four models. And you'll notice that there's a little green check mark there. If I hover down over any key, I'll see a blue, non-published-- is what that's basically telling me. The latest version has not yet been pushed to the cloud.

So it's letting me know I can just click the blue thing and it now will upload that to the cloud, whatever the latest version is. But we've published out Arch. In fact, AP published it out just this morning, at 8:33. And then perhaps more interesting is this Actions button. Now I really want to spend a second on this because, first of all, Rename. I can rename any file that I have access to, even if I'm not in it. And it won't break for anybody, even if I have 100 users currently editing that file somewhere else in the world.

This is not trivial, guys. Like this is not something could do-- this is the first time in the history of Revit that you can rename every file that's being work shared, and not break anything, right? So they'll just, when they sync next time, it'll just change the name at the top of their Revit experience. Cool, right? Done. So Rename, awesome.

Relinquish. I can relinquish everybody out of a file, anywhere in the world, at any time, out of that model. It won't break for anybody that happens to be in the model working. They'll just kind of immediately re-borrow whatever they're messing with, right? But for that project manager that, you know, checked out some things and then left on vacation and didn't relinquish, and you end up having to log in as them-- you guys know the story-- I can just relinquish them out. Boom. Gone.

AP PERCOWYCZ: That never happens.

AARON VORWERK: Never happens. I'm going to come back to View Versions. There's Delete button. Now this one, I wish it had like four confirmation dialogs. It only has one. This will actually remove it from the Collaboration for Revit service if you say delete. It doesn't remove anything you publish from BIM 360 Team. It doesn't remove the local user data caches. And so somebody can immediately re-collaborate, but there are going to be ticked off and give you a phone call if you delete the model and then you confirm that you want to delete the model and it removes it from C4R.

But you do have, essentially-- for the person who asked about backups-- you do have multiple locations for backups. You have-- every user that's ever participated in that project has a cache file. So whoever's been in it lately is going to have the most current backups, in cache form, that can be restored to a model. You will have, as I'm going to show in a second in View Versions, every sync ever of the Revit model is stored in here.

So if I go to View Versions, there's only 16 versions of this model that have been synced, right? And this is for whatever. And if you sync with comments, then your comments actually

post. So that's good. I can roll back to every sync ever. Right? So if I had 15,000 syncs, which is not unrealistic for a project involving 100 participants over several months, they're all stored and they're all free. They don't count towards a quota on BIM 360 Team, or anything. But every sync ever is available. Yes, sir.

AUDIENCE: Is this access point local as well?

AARON VORWERK: Once you're inside a team as a full project member for that project, you have access to that project, period. Yes. We call it high trust, highly collaborative. And there's good, there's good and bad about that. Yup. Now, if my MEP engineer syncs my file and I'll see it-- if I didn't have Work Sharing Display Settings on and see some strange color and go, what's going on-- and he syncs there and I'll be like, really? Pick up the phone. But also, immediately roll back to the previous version, right? So like, I have a button right there to roll back to any previous version.

But yes, you're right. So people hearing that, that we have the ability once we're in this environment for that one project, we have access to that project. Yes?

AUDIENCE: [INAUDIBLE].

AARON VORWERK: Yeah, it's fine. No problem. Yes. It won't break for anybody.

AP PERCOWYCZ: We can actually-- sorry. We can actually show that in the Manage Links. It'll basically just append the new name. So it automatically recognizes--

AARON VORWERK: Yeah. It's beautiful. It's really, it's a beautiful thing. So that's the View Versions. And then of course, when we're talking about publishing out BIM 360 Team, everything that is stored there is also a backup. But those are probably more-- not as frequent, obviously, as the syncs to the model. The syncs are your more instantaneous backups.

And I've had people ask the question before. I don't want to get into the weeds too much. We're getting lower on time. But you know, question before-- what if I lose internet connection. I'm like, really? So look around the office, and nobody has access at all? We might have a bigger problem than whether we're working in Revit today. We might be running for cover.

So, but if that was really a problem, you would have then you would have to default back to somebody's local cache and pushing that, or making that the file again, which is possible. But hopefully you'd have a phone and you be able to call us. Because if you have a phone, I would

be surprised if you wouldn't just be able to pull the model down. Yes?

AUDIENCE: Is there any tool on there that would help us figure out who the last, best version would be?

AARON VORWERK: That's what we were just looking at. But if you're not talking about who's-- that shows who's last synced. Right? So you got every sync ever. Right? So you've got the last sync sitting there. But if for some reason you had no connectivity whatsoever, then it comes down to talking to each other in the office. Why's synced, or, you know what I mean? That would be a rare-- I mean, I'm trying to imply that's a very rare situation where I can't even find a cell phone to get access, or something.

AUDIENCE: When it goes down, it's not my side. It's probably your side. I realize you wouldn't want to hear that, but the last three, four, five weeks, I've lost two hours on any given day, once a week, because your site went down. And then it becomes a matter of, which one of my users has got the best version?

AARON VORWERK: Yeah. That's fair. Right. No, that's fair. So the question was about, what if we go down? And it's obviously, it's not Amazon going down, guys. It's, you know, their uptime is 99.997% over the last 365 days. It's us breaking things because we're trying to improve the service. And we don't do it very well, sometimes.

And so if that happens, then that's a good point. Then you're just not connecting. So that still requires the conversation of who synced last. Yeah, that's right. There's not, there's not a local tool that will dive in and look at time stamps. Although you would be able to have that discussion.

This is probably another part of the reason why the larger firms-- this wouldn't happen at like a one to three person office-- but the larger firms that have used our service will create a sync schedule so they kind of know where the latest model file should have lived. You know, you're syncing on the quarter of the hour, you're thinking at this point. Yes, sir.

AUDIENCE: One question about the shared parameters and [INAUDIBLE].

AARON VORWERK: Yeah. So the question is about shared parameters. I would argue this is about any length that is not a Revit file, which would include things like shared parameter file location, so on. This is the same work around right now as what we have with Revit Server, where you would have a map network drive location that everybody has to mimic in order to access things like CAD files

or point clouds or shared parameter files or family libraries that need to be in one central location. You'd have to kind of do it the old-fashioned way. That's a very, very well known issue inside Autodesk. I'll just say that. Yes.

We know there's things like that. And the permissions question, those things need to get better. The thing that we're focused on right now is making sure the service is reliable. Because we can't have what's happening in the, that was mentioned in the back of the room. The scaling of the service-- I can show you a graph-- but it's very heavy usage. So we're having to make our pipeline handle that with more stability. That's a focus.

AUDIENCE: What was the workaround?

AARON VORWERK: Every user that's involved can map a network drive to a single location. They just have to have the same path so that no matter who opens the file, it finds it, right? I did that with, I had a 12 gig point cloud. I don't want to sit that in the cloud. So we all had it stored locally, in that particular case. It's an odd solution but the point cloud is not going to change throughout the project. So we did it that way in kind of reverse.

OK. I want to, I could show you Communicator very fast, and then we've got to kind of jump back in and close. So Communicator is this other piece you can see floating on the screen, that I mentioned in-- or if I didn't mention, I should just show so. We talked about not being able to track things inside Revit. But now we have essentially a chat tool that is diving into the Revit model with us.

And so in this particular project, I've got myself and AP and a couple of other guys. And for some reason, AP is offline. But anyway, in this project we can be not only putting our users into groups of participants-- like so I'm going to chat in my internal group. I'm going to chat with my consultants. I'm going to chat with my owner And have those all be separated chats so that we're not seeing each other. And those chats are exportable. And so for record purposes, they're not deletable.

And so I have this record of design decisions. This is not overall project communications. That would happen inside Team or inside of another application, like an Outlook. You can email your team and it gets stored with the team record. Like you can actually have an email address or alias for your BIM 360 Team project. But in this case, we're talking about end-to-end, down and dirty users that need to make design decisions, take screenshots, and so on. And that's what you can do directly inside of Communicator.

And so I might have chats going with multiple projects at the same time. So this is TS Collaboration project. I forget which one that is. But I'm chatting here with Caesar and he's added a door. These are just screen shots taken directly out of Revit. I have one here that, I was asking people, who's gotten into 2017.1 a while back. And then AP just shot me this screenshot, saying, hey, we need to review this before tomorrow's class, which I obviously didn't do. So I could respond to him and say, you know, sorry, man. But this is keeping up with the project, right?

So we have those going on. We might have lots of these. But of course, we're just demoing this thing amongst my team. What's cool is, I'm demonstrating this solution. I have team members across US, and we just kind of chat back and forth, here and there, trying to keep it professional since it's going in front of you guys.

And then we have the timeline, right? This is what's like, Worksharing Monitor or Project Bluestreak, right? Just showing all the syncs, when they failed, when they were successful, who synced. And then hopefully people use comments once in a while, because it helps to explain what they were working on that day. Yes, sir.

AUDIENCE: So when you're logging people out of your office to work with you in this environment, they still have to have a license, right?

AARON VORWERK: They have to have access. Yes.

AUDIENCE: Are they going to have to pay their own license to get that?

AARON VORWERK: Yes. This would be, again, for the users. This is not project wide. This is user-to-user communication. Like I'm asking the structural engineer about this decision, and so on. So they will be people that are in this project with me. Yeah.

AUDIENCE: Now, if we provide that environment and the help and the C4 location for all [INAUDIBLE], and we invite a person from outside of the company, that person cannot just jump in and work with us unless he has a license.

AARON VORWERK: That's correct. So the question was about who needs to own C4R. Let me wrap this and I'll come back to that real quick at the end. So let me toggle back. Yeah. So common questions, just to kind of close this out. So people ask about data security. We are a very clear and

transparent about data security. If you go to autodesk.com/trust, and we can provide you white papers with a lot more information. But we don't own your data. We tell you where it lives. Obviously, I've been talking about it the whole time. So if that's a question, we'll address it. Perfect.

People ask about file sharing and say, hey, you know, we don't work with consultants using Revit. It's just us. Or, we only have one office. I'm like, OK, I get that. So your ROI is different than somebody who's-- like it's a no-brainer for someone who is an architect of record collaborating with a design architect. That kind of relationship is terrible, normally. And so we now have a solution that makes it very easy to do that. I can point you to some of the largest firms in the world. And they'll say, man, this is amazing. Even at their scale, right?

But for you, if you're just saying, well, I just, I want to work from home, great. We have a solution that allows you to just work from home, or wherever. And it just works. OK? Another question, we're concerned other people could edit our models. Question from the back a minute ago. That is true. You can roll back to any sync, ever, which is important. You'll also see who synced and when, which is important.

So you can pick up the phone or go in Communicator and be really mean. But it's stored forever. So make sure, for liability purposes, that you're, you know, professional. But any way, that allows you to see who's doing what, to roll back. It is high trust, though. You may not want to pull this out as a solution for somebody you've never worked with before, without setting some ground rules first, Right?

People will say, we use Dropbox, or whatever. You know, and again, I kind of pointed this out earlier. But that's not project focused. It's great as doing what the one thing that it does, right? It is very good at that. But if you need to be able to understand projects, get into project data, use that killer viewer on any device, then you can't get there with a generic file storage solution.

People will ask about batteries in their pointer. So storage, right? So we had it set, when it was A360 Team, at 10 gigs per user. We didn't enforce it, but we said it at that, arbitrarily. The thing about that is that it's actually harder to hit than you think. Nothing that's in C4R counts towards your quota. When you publish out 100 times, only the latest version counts. It overwrites all the other ones but keeps those backups for free, inside of Team.

So to hit 10 gigs per user actually took like somebody going to the side and uploading a bunch

of point clouds or something. Because you can't get there just uploading models unless you really have a lot of models going on. Because it's only for the active projects. When you say, this project's done, deactivate, it keeps it there. But it doesn't count towards quota.

So we have, it was hard to hit 10 gigs a user. So now we made it 500 gigs a user. Good luck. Try to hit that. We don't enforce that either, probably, but it's still there. And it has nothing to do with A360 Drive. I'll come back to that in a second. So people will get confused sometimes. Hey, I've got 25 gigs of storage in A360 Drive. That's still there. That's still your independent, little nugget of storage. That has nothing to do with Team. OK? Just to be clear.

You can access stuff that's in Drive from Team, which is kind of interesting. So you can use the cool viewer and all of those tools on your old drive data, by the way. This is the only product I ever talk about pricing with. I'll be real fast, OK? Because Team is cheap. You know, depends if you buy it monthly or annually. So $15 a month, or $10 a month if you buy it annually. This is American dollars, obviously.

But if I'm in a project, I rarely would buy it. Why do I say that? Because anybody you've invited that's outside your firm as a consultant, as a project contributor, is free to get into Team. Anybody in your office, like your principal or whatever, that wants to look at files, they're free. It's only the rare user that doesn't have C4R-- but wants to be able to manage who's on C4R projects, basically, or who's in Team projects-- that would need to buy a license of it.

So that's not a whole lot of people. Because everybody that has C4R-- which is more expensive, obviously-- but everybody that has C4R gets Team. You know, because it's built on that. So they have to have it. That's why we talk about these two things together, if that was unclear.

So we did a real simple ROI-- just to ignore all the server stuff, ignore all the stuff that sets it up-- and just say, look, if you buy it annually, $800 a year that comes out to be, as you can see there, if you bill out at $100 an hour, it comes out to be a 9.2 minute per week payback. So if you save 10 minutes a week per user, you've already paid for C4R before you talk about hardware, server maintenance, IT expertise, any of that stuff. No BS. Straight, straight numbers. OK?

Most people are terrible at understanding how much time they lose. Firms have never sat there and said, how much time do I spend uploading and downloading files to exchange with

consultants all week, then reformatting them so I can bring them in, and blah, blah, blah. Right? It's more than 10 minutes a week per user. I guarantee it. And in larger projects, it might be a person who spends a day out of their week doing that. So you paid for this many times over. Yes?

AUDIENCE: What about token costs?

AARON VORWERK: Yeah. For larger customers, there are-- I don't have the payback for you on tokens, but that's accommodated. Yeah.

AUDIENCE: We make token [INAUDIBLE] costs.

AARON VORWERK: Yes. Yes. And but we're territory business folks. So we don't get into major accounts, token, flex, much. Good question about how it's structured. But the point is, really, it's a very minimal cost. People get overwhelmed a little bit with the cost sometimes until they realize, until they put their actual time against it, and they realize, wow, it doesn't cost me anything. And I'm wasting, think about how much money I'm really losing right now.

So that's kind of the quick ROI. If there's any last minute questions, we're right at the end of the time. So we're here to answer questions.

AUDIENCE: A question [INAUDIBLE] about backup.

AARON VORWERK: About what? A question about backup. Yeah. So I mentioned all the places where it's backed up. Right? Every user's local data cache. Also infinite syncs inside of C4R. Also everything that's been published to BIM 360 Team. So you have at least three places where, which includes all local machines that have been involved, plus the two cloud locations.

AUDIENCE: [INAUDIBLE].

AARON VORWERK: Yeah. Any time you like, you can download. Right. So the question was about, what about local backups, just for archive purposes. I recommended milestones, right? Every deliverable, you should probably be pulling that down, if you like, to your own secure storage. Question?

AUDIENCE: You can roll back any model.

AARON VORWERK: Yes, sir.

AUDIENCE: Roll forward. Somebody asked about rolling back too far.

AARON VORWERK: Question's about rolling back versus rolling forward. Interesting discussion. No. When you roll back, you roll back. And that's, it's not like, hey, cherry pick this version I want to load today. So what I always recommend in that purpose, or that situation-- where that decision was made a month ago that we're never going to go that route, and then the client changes their mind today and says, we actually do want to go that way-- you have a sync from a month ago that included that huge wing of the building that you've since deleted. Right?

So in that case, if you didn't archive it locally, which you probably should have. But if you didn't, and that's the place I need to go, I would take my current file and do a Save As. So I've archived all the stuff I've done in the last month, then rolled back to a month ago, and then pull those two things together. Or pull both offline, and then upload a new version. Yeah. It's good to be aware of. Question?

AUDIENCE: The cache, it defaults to a folder inside of a folder. Is there any way to change that default?

AARON VORWERK: To my knowledge, no. The question was, can I change the place where it puts the files in the cache, the collaboration data cache folder, deep inside the user data cache. To my knowledge, no. But we'd have to talk later to the product manager about whether that is accessible in the API. The API is rough for this, but it's there. Yes. Thanks.