AS469144

Virtual design collaboration using Arkio and Forge

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Learning Objectives

- Discover how VR/AR can be used for collaborative design on top of Revit models
- Learn how Forge Design Automation enables a seamless, bi-directional workflow between Revit and Arkio
- Understand how live design collaboration opens up new workflows for AEC professionals
- Learn how AEC firms are starting to leverage this technology to work with clients in a more efficient way

Description

Learn how Arkio enables users to design together on top of Revit models and export the result as native Revit elements by using Forge Design Automation

Arkio is a design tool for bringing your ideas and conceptual building designs to life inside VR. With VR you can immersive yourself in the creative process by freely walking around your design or stretching a wall with simple hand gestures. But how do you get your hard-work into BIM360 and Revit?

Recently, Arkio built a solution to make those conceptual designs a first-class Revit file in BIM360 - the very beginning of the BIM process.

In this class, we will deep dive into the Revit API and “Design Automation for Revit” to create two new workflows. First, a user can easily load their latest BIM360 Revit models, on any device, collaboratively make new design proposals and second, push the results back to Revit & BIM360. This class gives an overview of how this works and how architecture firms have been using this technology to enhance their design workflow.

Use-cases demonstrated:
- Loading Revit models via BIM360 and the Design Automation API into Arkio
- Creating new design proposals on top of existing Revit models using a variety of VR/AR sketch and modeling tools inside Arkio
- Live collaborative design using mobile VR headsets, tablets and phones
- Loading and working with additional data like program area requirements
- Exporting new design ideas as native Revit masses/families via the Revit Design Automation API

Speaker(s)

Michael Beale

Developer Advocate at Autodesk

I joined the Forge Team about 2 years ago, and I help Developers get started on Forge APIs and help them build their first Proof-of-Concept. Before that, I worked on Forge Viewer, Autodesk Homestyler, Proof-Lab and Stereo-Panorama's.

Twitter @micbeale

Johan Hanegraaf

VP Product at Arkio

Johan is an architect and engineer with 10+ years of experience in the industry and has been speaking at conferences worldwide on topics ranging from Revit, Dynamo and Unity VR development.

Twitter @Johan_Hanegraaf

Hilmar Gunnarsson

Founder and CEO of Arkio

Hilmar is fascinated with using new mediums to unleash creativity. Prior to Arkio he founded Modio, a startup that developed a creative toy design and 3D printing app that was acquired by Autodesk.

Twitter @hilmarg

Introduction

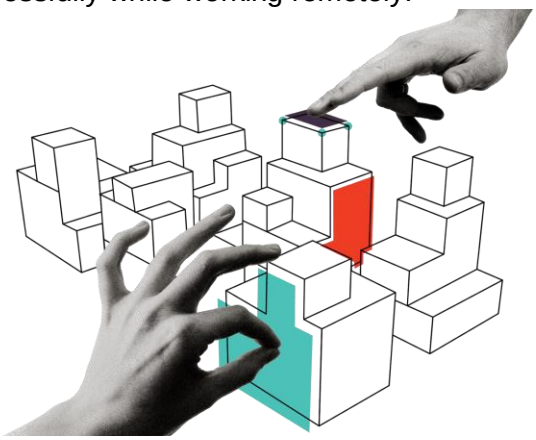
My name is Michael Beale and presenting with me today are both Hilmar and Johan from the Arkio team. I am a developer Advocate for Autodesk on the Forge Team. My job is to help and support developers build their first Proof-of-Concept with Autodesk Cloud Services. It's a fun gig, and I get to see lots of incredible ideas and sometimes, I get to help these talented developers, bring their ideas to life. With a bit of luck, they turn into business. Today, I'm happy to share one of those cool ideas - Arkio.

Rewind about 3 years ago, just when the Magic Leap first came out, and that was when I first met the Arkio team. Hilmar demo'd the first prototype of Arkio up in the Autodesk 2nd floor Gallery in San Francisco. I could already see the attention to detail in the UI, and that this was the team to finally VR design tools to the AEC industry. Just last year, during AU2019, Arkio team finally came out of stealth and demoed their latest version. It was there we discussed some new ideas on Design Automation for Revit and BIM360 integration and how the Forge Accelerator helped speed their development.

Arkio

At Arkio our mission is to simplify the architectural design process, to make it more efficient and collaborative than possible using today's flat-screen design tools. We basically want to give designers superpowers. With Arkio you can easily get together with other people in a shared virtual space and try out new design ideas or markup existing 3D models. You can join a design session using a VR headset like the Oculus Quest, your PC or even your phone - which means that everybody can participate wherever they are. And that means you can work faster, collaborate more easily and reduce misunderstandings that can prove costly at later stages in the design process or even during construction.

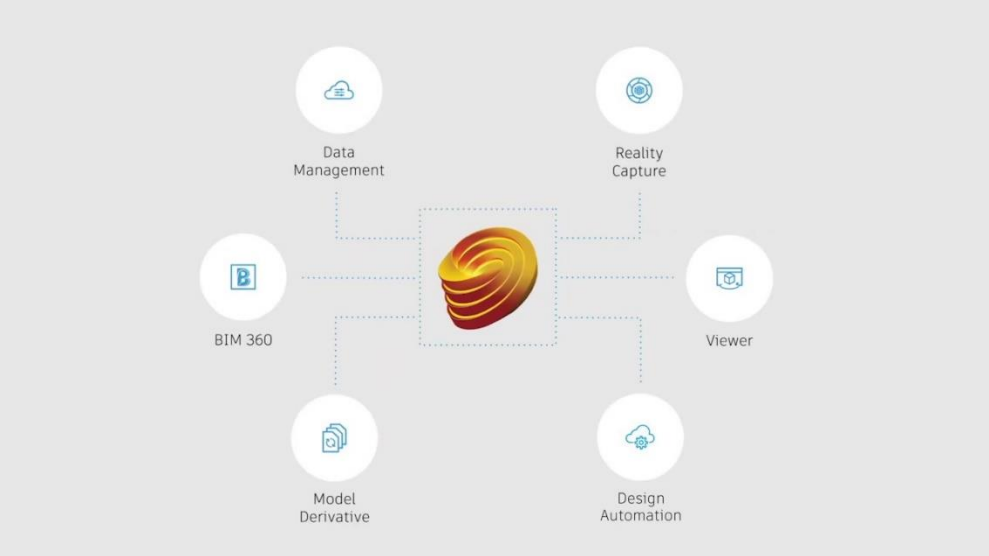
The Covid-19 crisis has highlighted the need for better collaborative tools as design firms have been trying to stay productive and interact with clients while working remotely.
In our video presentation we'll be doing a virtual interview with David Morgan from Sasaki, one of our early beta testers and he's going to share with us how Sasaki has been using Arkio to collaborate and interact successfully while working remotely.



Collaborative modeling

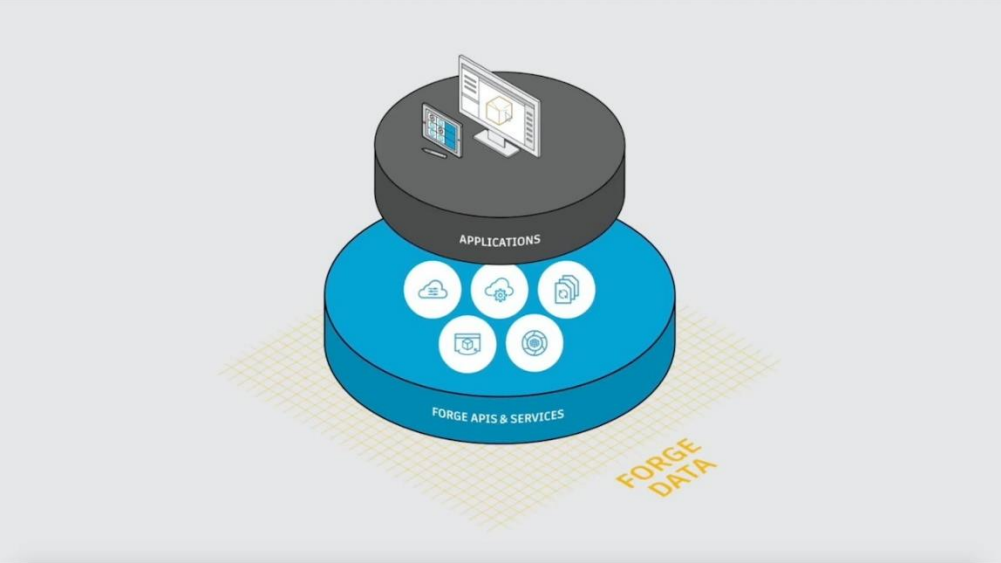
Forge

Forge is Autodesk's cloud development platform. It's made up of modules like storage and conversion viewing, and it's a cloud-based service. So, you use restful APIs to access it. It helps you tap into your engineering data like revert, IFC or AutoCAD, and you can run AutoCAD or revert engine in the cloud without needing a desktop PC.



So, this new data flow unlocks these CAD data silos, helping to connect your teams and other businesses in new ways while also providing new data insights.

Forge is the foundation of applications is data on the bottom services in the middle and an application like BIM 360 on the top, or your application Arkio's application uses BIM360 APIs and Design Automation for Revit.



Extending Arkio service to Forge was a natural fit as it aligned with their vision to empower designers to work together on their latest designs from any device. A lot of today's design documentation and coordination work is done using Autodesk Revit but designers often rely on the expertise of their teams Revit specialist to make edits, export or prints from these models.

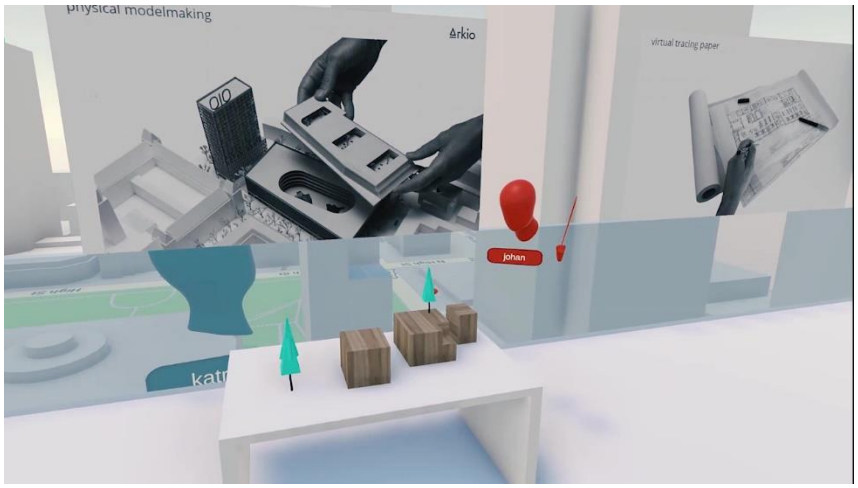
Arkio's team started this year by building a closer integration between Arkio and Autodesk Revit using a native Revit plugin. By extending this service into the cloud using Forge and Design Automation for Revit we could provide our users with an even easier way to access to their latest Revit models without having to open Revit on their workstation.

But that's only half the story. With Design Automation for Revit it's now also possible to push the updates done in Arkio straight into a Revit file on BIM360 without users having to leave Arkio.

Why are we building Arkio

The creative process in Architecture traditionally uses sketches and foam models. Nowadays most of our design work is done in 3D but we still use 2D screens for creating these models We now have technologies to experience our designs in 3D using Virtual and Augmented Reality. But when we want to try out something new, we need to go back to our 2D devices.

With Arkio we want to re-imagine architectural design when we are not bound by 2D devices. Where you can use your hands to model in 3D just like working with physical models that can be picked up, slide and glued together. We see Arkio as a 3D tracing paper where you can quickly prototype ideas together at scale on existing 2D or 3D content like a Rhino, Sketchup or Revit models.

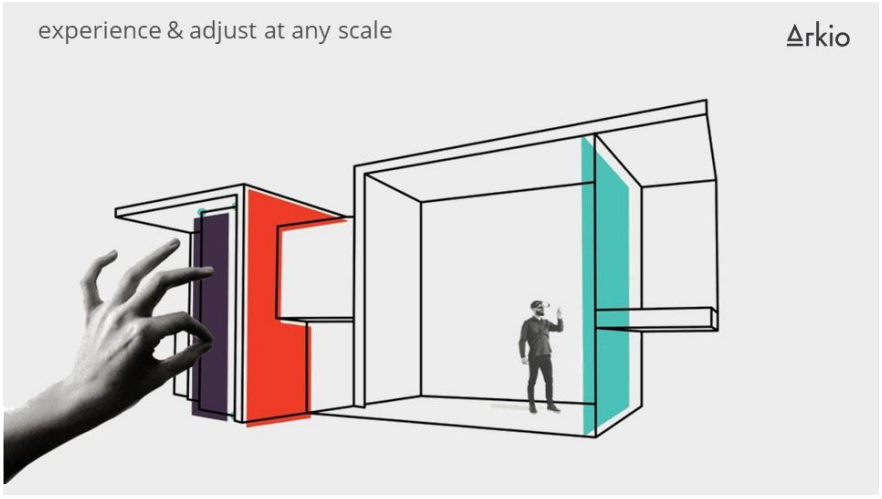


Since last year we build a close integration with Autodesk Revit making it easier to load your design and draw new volumetric suggestions on top like this model that can be exported back as native Revit geometry.

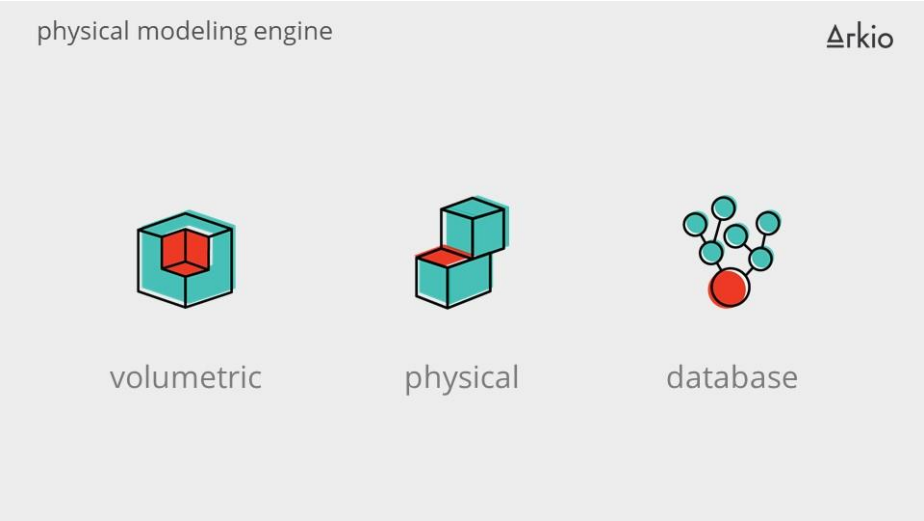
How does Arkio work

To create solid shapes you pull up, to create voids you push down into the underlying shape. Arkio is a fully parametric solid modeler and when you move and edit shapes faces snap and join at the edges. You can grab and distort objects, edges and corners by reaching into them using your VR controller. The best part is that this is all fully collaborative, so many users can make edits to the geometry at the same time. You can compare it to a real-time BIM environment where everyone can see the changes you are doing at the moment they are edited.

All the modeling and interactions you see in Arkio are driven by our multi-user modeling engine that handles real-time boolean operations, gluing, hosting and disjoining of objects and faces and makes objects snap with haptics to make the experience feel like physical modeling.



Arkio is a non-destructive volumetric modeler that uses smart component that can be glued and bashed like physical building blocks. All object are automatically organized by dependencies in a spatial graph that can be translated to Revit and other BIM tool as clean solid geometry.



If you import a Revit model into Arkio you can sketch on top of it and explore new design options. It's possible to work in any scale in Arkio, when you want to do more detailed work you just scale down to a comfortable size. Arkio elements are adjustable once created, so you can make a rough first draft and fine tune things later.

One of the main features of Arkio is that you can join a design meeting even if you don't have a VR headset as Arkio also works on desktop PCs, phones and tablets. Here you can see how a user with an iPad can see everything that's going on inside the meeting as we sculpt the new tower a little bit. On the iPad I can easily navigate around the model, and communicate design suggestions with users inside VR using sketches.

Another key feature is that you can add program tags to individual floors and immediately see total area sizes and how close you are to meeting your program requirements. You can also see these updating on the iPad as the tower is being worked on, and even edit program tags on the iPad as well. It's even possible to create entire towers, and move things around from non-vr devices.

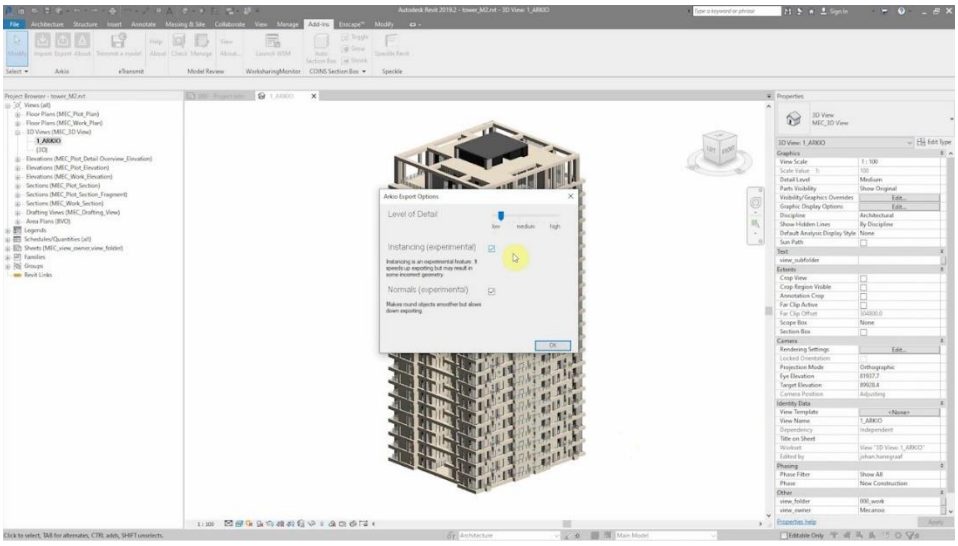
Design options are another powerful feature of Arkio. Simply make a duplicate of the model, try out some other ideas and toggle back when you want to compare them. And by placing the model on a table in AR using a phone or a tablet you can see everyone working in the scene and even sketch or model something in AR.

Creating spaces while experiencing them from a human scale is really powerful. These validated spatial objects can be re-used once loaded back as native Revit geometry. And we can play with the time of day to get a feel for how light will flow into the new meeting space.

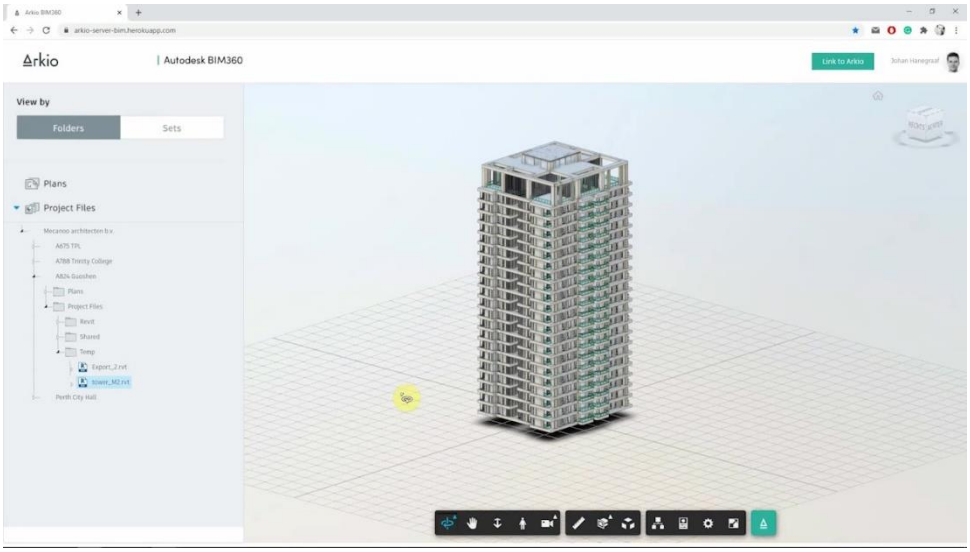
In Arkio you can work with parametric shapes that have a fixed wall thickness. Useful to quickly prototype interior spaces by adding walls and carving window openings. You can easily make copies and arrays of various complexities and make edits to this geometry to live update all the attached geometry. This is powerful and you can explore different design ideas without having to redo the modeling. We can also make sections into the buildings to see what is happening inside our creations. When we are happy with our design, we can export the design options to 3D or native Autodesk Revit.

Revit integration

In Revit we can easily export a 3D scene to Arkio using our existing Revit plugin. This plugin allows us to select the level of detail to reduce the number of polygons for working with the model on mobile devices like the Oculus Quest, phones and tablets.

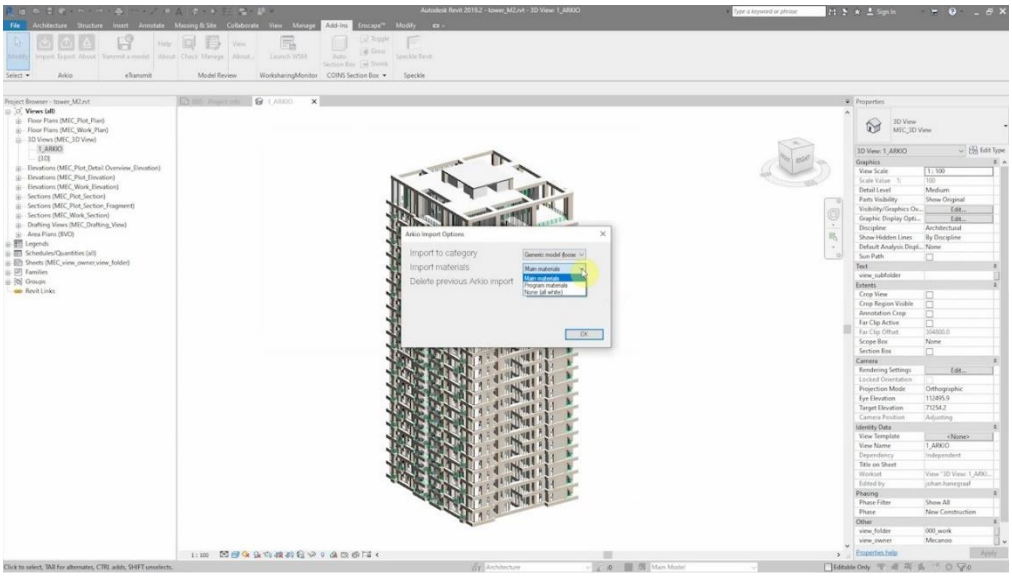


Once the model has been successfully exported you can bring it into Arkio. We also support importing of images, program requirements and other 3D models. With the new Forge integration users can now also get the latest version of their Revit models directly from BIM360 without having to open Revit.

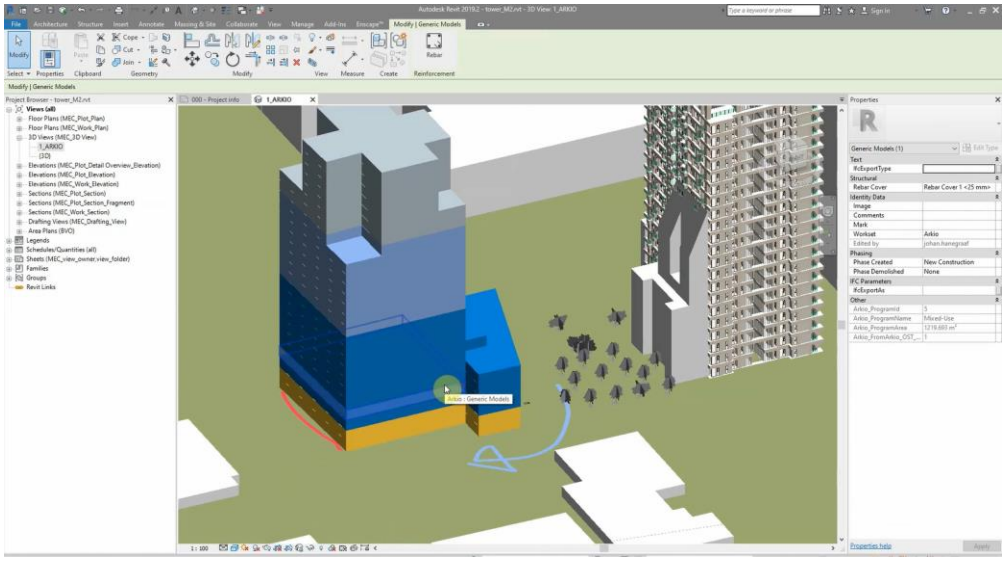


You can also use the Arkio Revit plugin to import Arkio models into Revit as generic models or mass families that can be used as a base for facades. You can choose what materials from Arkio to import and if you want to delete previous Arkio imports when loading new proposals.

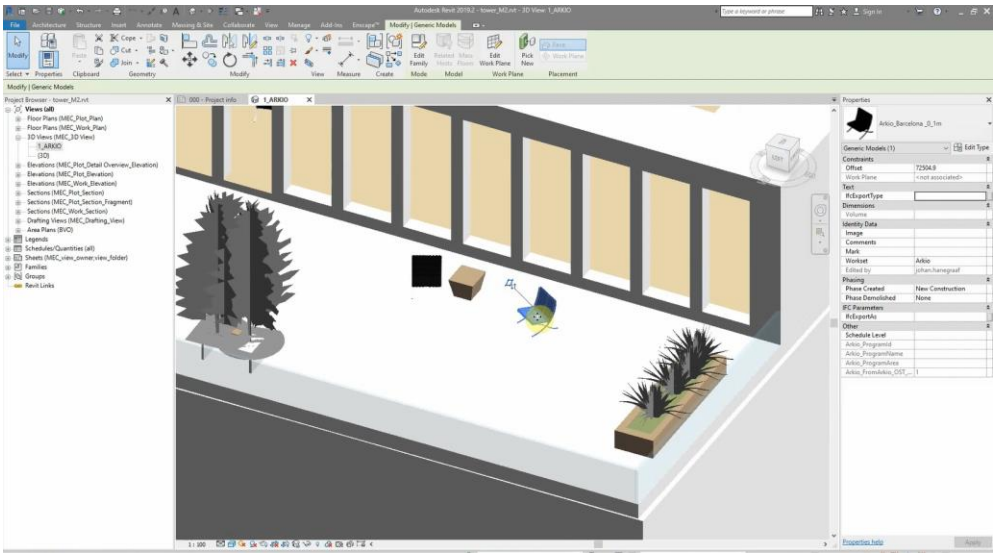
Everything created or loaded into Arkio will be converted to Revit objects aligned to the original model, including 3D buildings that generated using the Arkio map feature which uses Open Street Maps data.



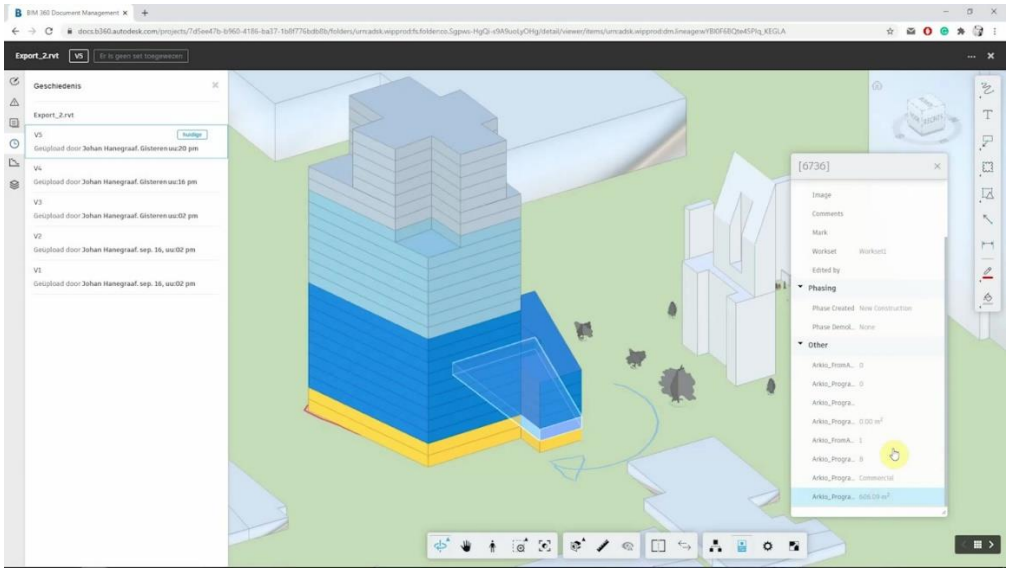
Volumes in Arkio get converted to native geometry and Arkio props like trees, people and furniture get created as native Revit families. Sketches are imported as well as program data and materials that are contained in the geometry.



Even custom imported 3D objects will be converted to a native Revit family so they can be easily updated or replaced by other Revit families in your library.



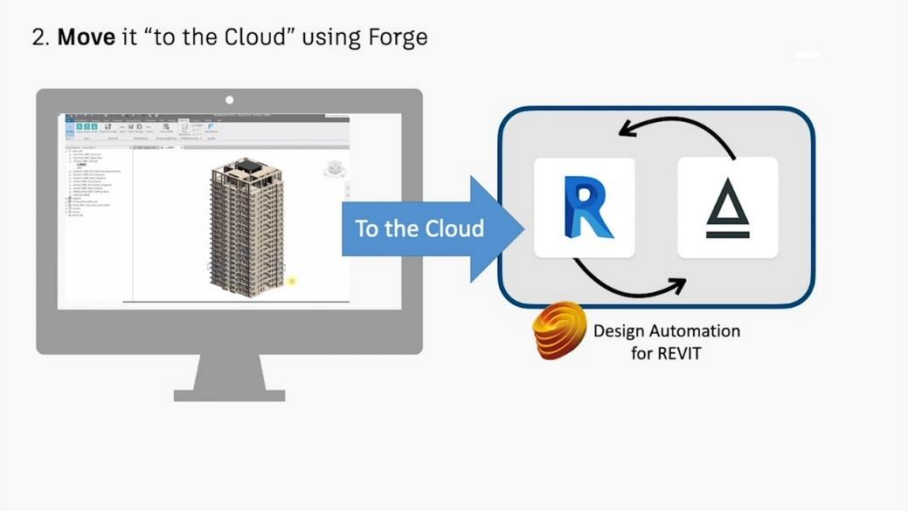
Using the new Forge and BIM360 workflow we are now able to create this Revit file in the cloud using Design Automation for Revit. When users send their Arkio file to Design Automation a cloud version of Revit will take the Arkio files and run our adjusted Revit plugin using the default settings. This way several design options can be exported at once and when the jobs are completed the user can find their exports on BIM360. Here users can switch between versions, and compare, track or overlay their files for coordination issues in tools like BIM360 Glue.



They can also download the Arkio Revit project and load it back into their worksharing project as a linked design reference. Here they can just use it as a temporary reference or bind the linked file to continue working with the new families.

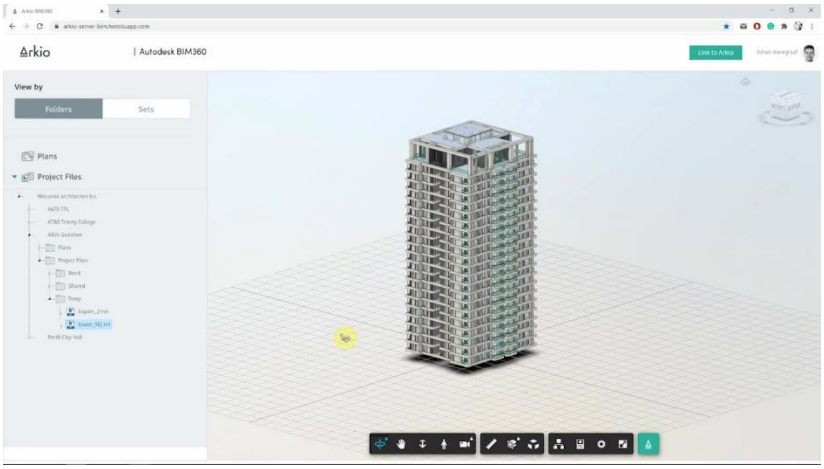
New Forge integration

Now let's deep dive into the technical details. When my team works together using Arkio on an iPad or Oculus quest, they would typically need a Windows PC that to runs Revit with a license in order to see their Revit designs. Using Forge we can access those Revit files from the cloud using cloud processing without having to open Revit ourselves.

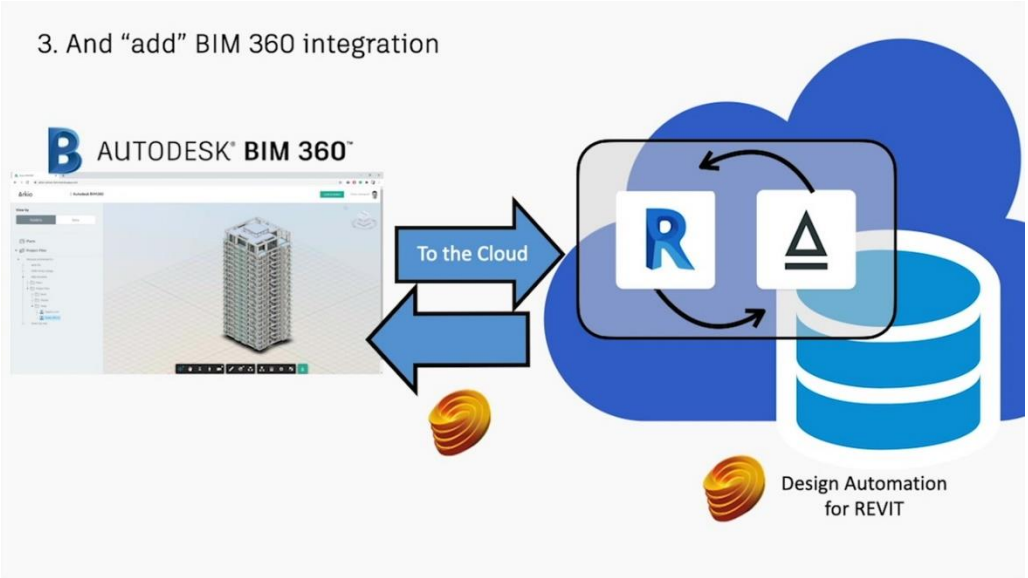


For this we take Akio's existing Revit desktop plugin, and move it to the cloud with the help of Forge, in particular we're going to use Forge design automation for Revit. And while we're at it, we'll add BIM 360 integration. Since my team already keeps the Revit files in BIM360 docs.

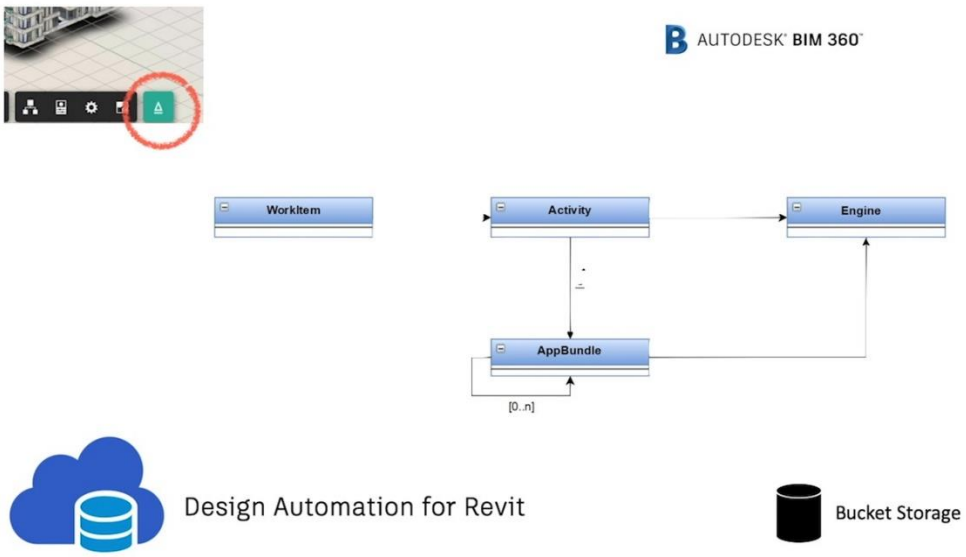
Let's go to the Arkio portal website and login with our normal BIM 360 username and password. In the background we're using forge authentication services for our Heroku server to access BIM 360 storage. You'll notice there's a familiar look in the Arkio portal, with a folder structure from BIM 360, where we can find our Revit file. There's a green button on the toolbar in the bottom that sends this Revit model into Arkio for everyone to collaborate on.



Design automation is broken up into four components. Our work item, an activity, an app bundle, and the actual engine itself. The engine is where the Arkio plugin is. When a job is started it creates a new work item, which then activates the Arkio plugin.



The Arkio plugin processes the job and part of its job is to download the Revit file from BIM360, process it, and save the results into a Forge bucket for storage, which we then access in the cloud.



Conclusion

Virtual reality offers many unique advantages when it comes to working together, not only remotely, but also when in the same location. The sense of presence, of being together in a model with other people and being able to intuitively understand design options is something you simply don't get with today's flat-screen design tools.

You can use Arkio to brainstorm design ideas together, either from scratch or by working on top of existing models from design tools like Revit or Rhino. Work at an urban scale for massing or try some new ideas for interior spaces using a VR headset or your phone. And with the new integration with BIM360 and Forge, it's easier than ever to bring your Revit models into Arkio, explore new design ideas and send the results back to Revit without ever touching your PC.

We'd like to thank David from Sasaki for joining us for this presentation and Michael and the Autodesk team for inviting us to present at Autodesk University

Immersive technologies like virtual and augmented reality are advancing rapidly. Soon you'll even be able to model inside Arkio with your bare hands, no controllers needed, and there's lots more to come, so stay tuned.

Hardware

Arkio runs on most devices. We support Windows, iOS, Android operating systems and will add more devices down the road.

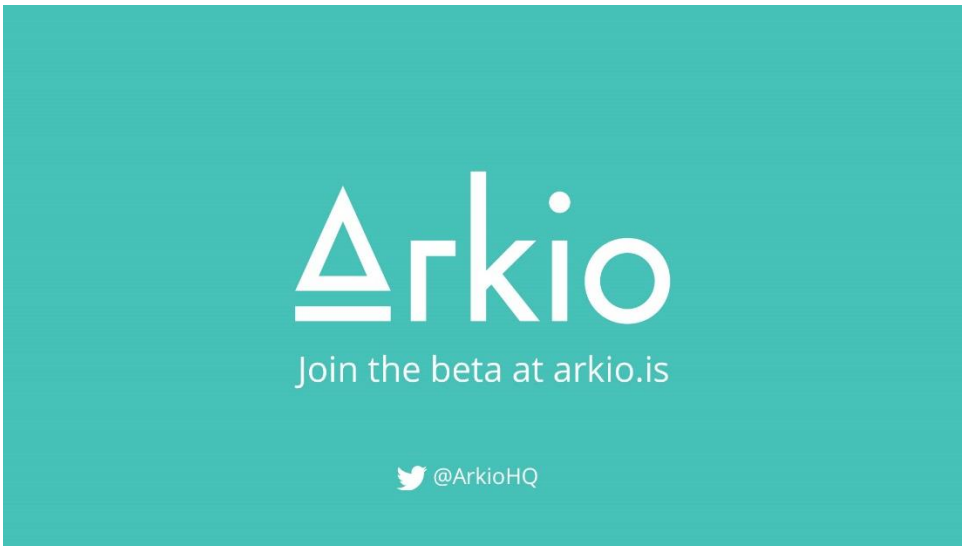
If you are new to VR and looking into for a good headset to start we highly recommend looking into the improved Oculus Quest 2. It's only $300 and is one of the easiest-to-use mobile VR

headsets available (it can also be connected to a PC via USB for more demanding applications like Enscape and when working with large imported 3D models in Arkio).

Oculus offers both a consumer version and an enterprise version that does not require a Facebook login.

How to get Arkio

Arkio is currently in free beta and we'd love to get your feedback, so please sign up at arkio.is and let us know what you think!



You can learn more about Arkio on our website and follow us on social media for news and updates on the development of Arkio.

Twitter: @ArkioHQ
Instagram: @arkiohq