

BIM 360 VR Collaboration for AEC with InsiteVR, Forge, and Unity

Angel Say

CEO, InsiteVR

Michael Beale

Autodesk

FORGE DEVCON



Class Summary

- Data-Prep / Data-Gravity
- Standalone VR: Oculus Quest
- BIM 360 to InsiteVR
- Case Studies
- Code Sample: Creating BIM 360 Issues from VR
- Building the “View in VR” BIM 360 button

The Speakers



Michael Beale
Developer Advocate, Autodesk Forge
@micbeale



Angel Say
CEO, InsiteVR
@sayangel

Key Learning objectives

- Learn about Collaborative VR
- Learn about Oculus Quest
- Learn how to bring BIM360 models into VR
- Learn how to customize the BIM360 webpage



AUTODESK® FORGE

Forge Accelerator

What is an Accelerator?

FORGE ACCELERATOR

Boston, USA

Feb 4-8

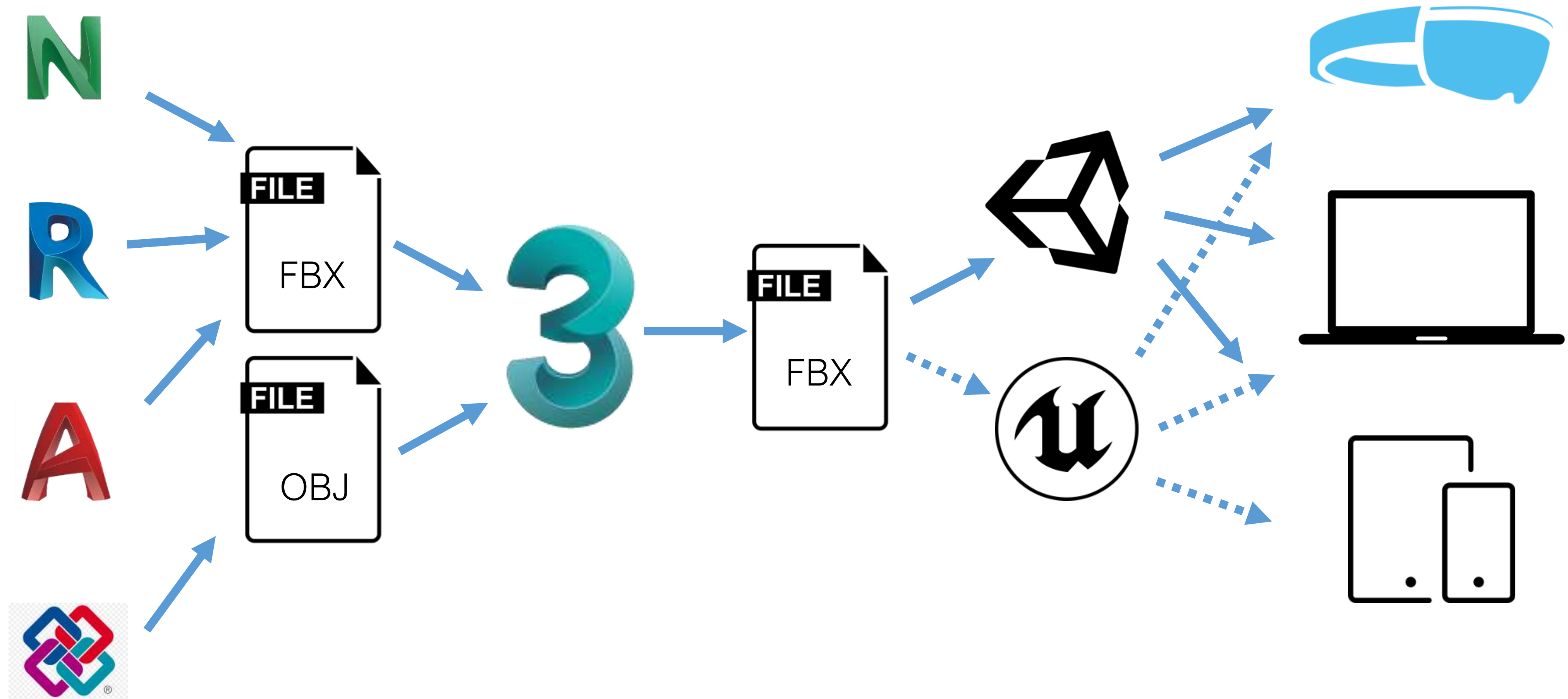


Data Prep

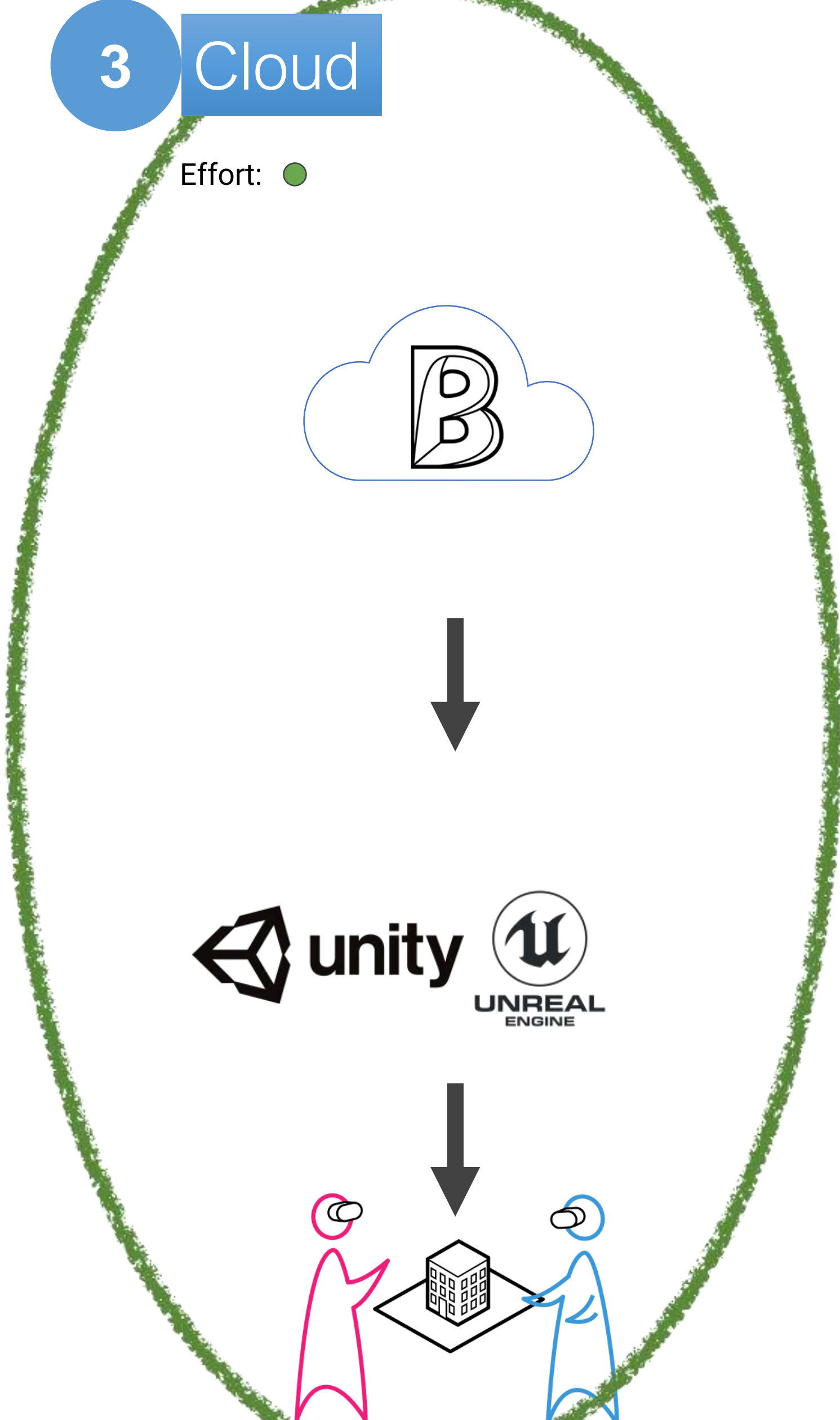
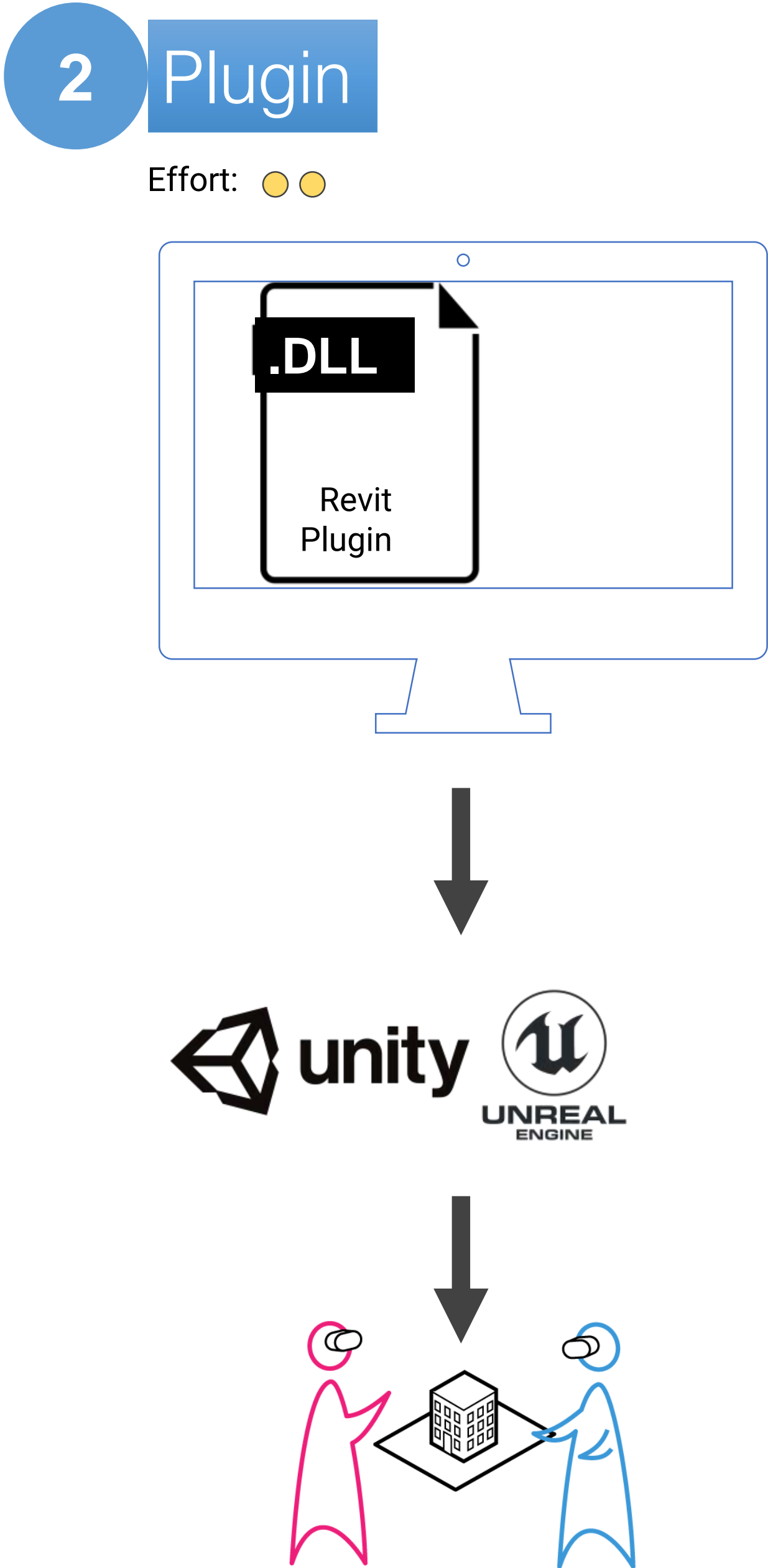
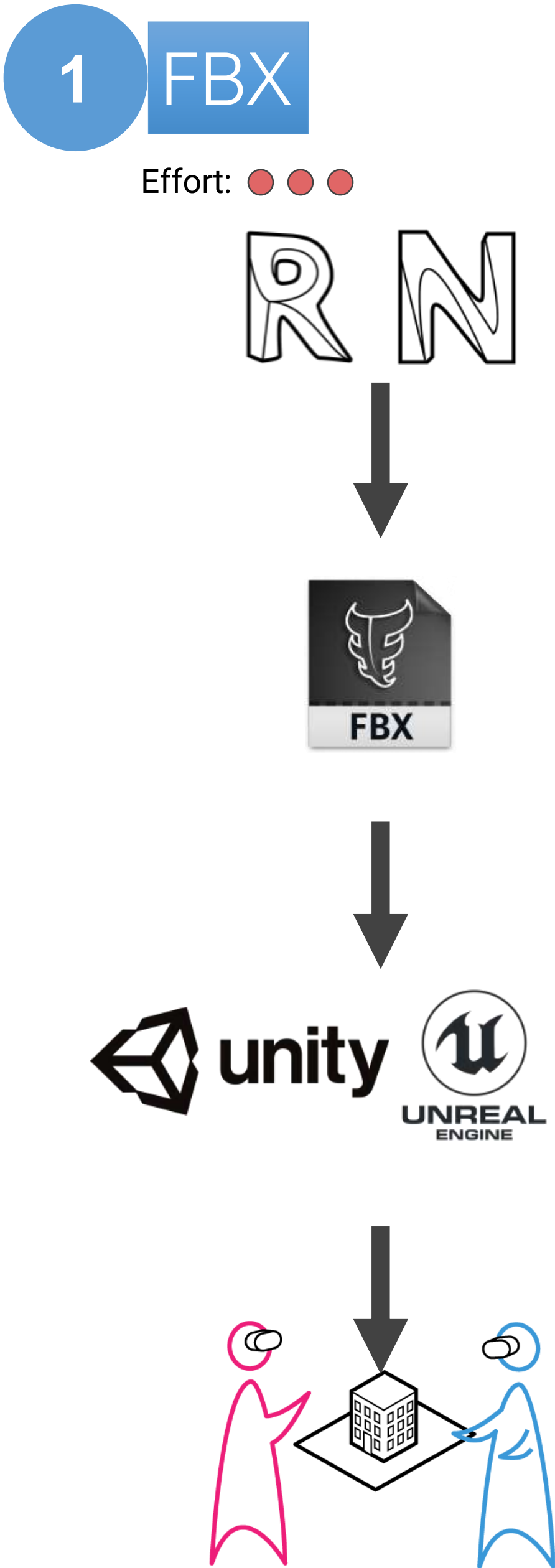
Trends in “Large Models”

FBX/Manual Pipelines

The custom AR/VR experience development pipeline of today overview

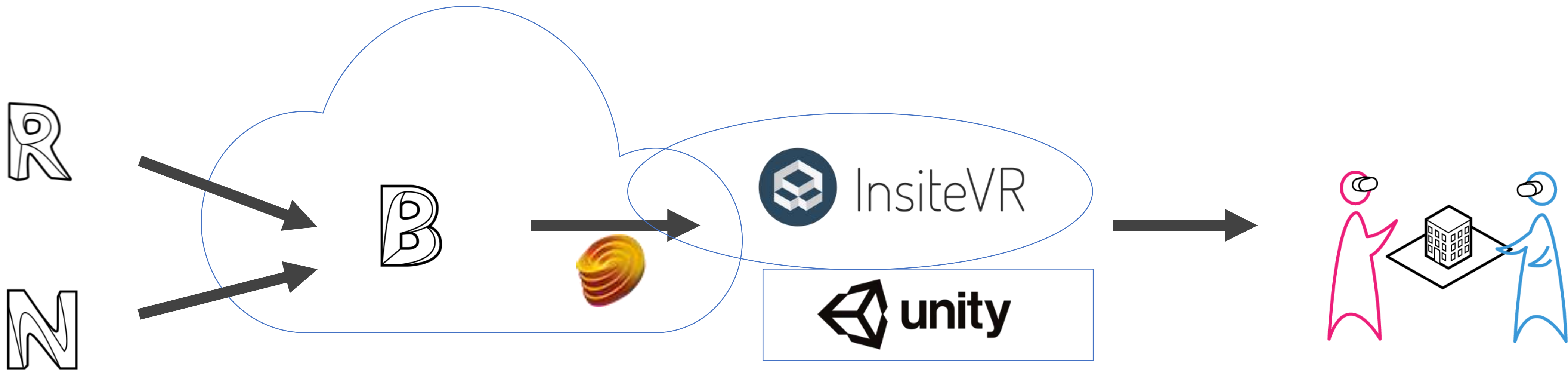


Cloud

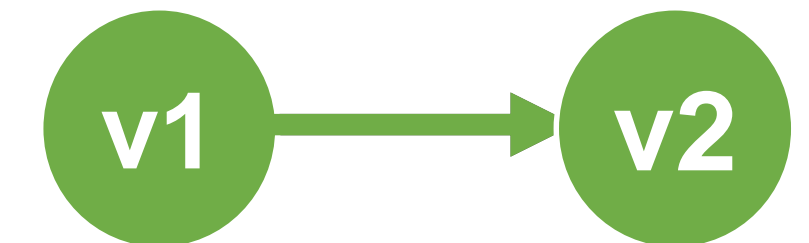
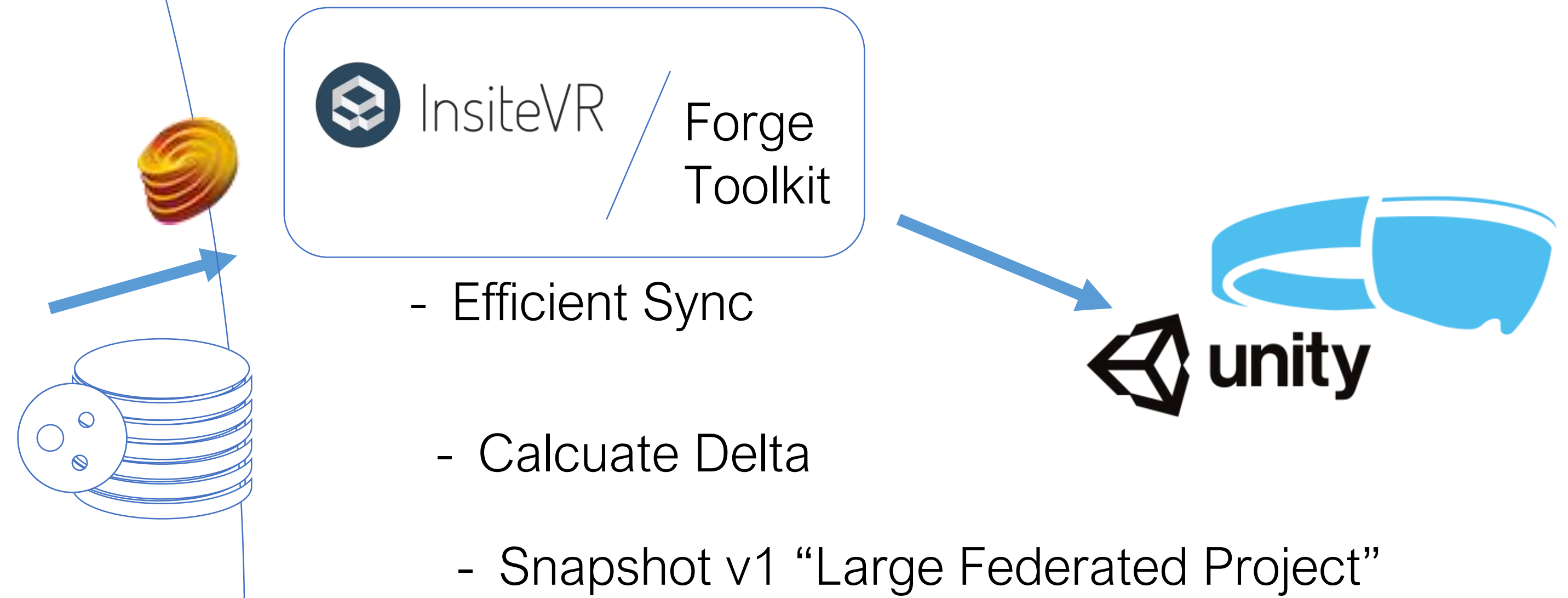
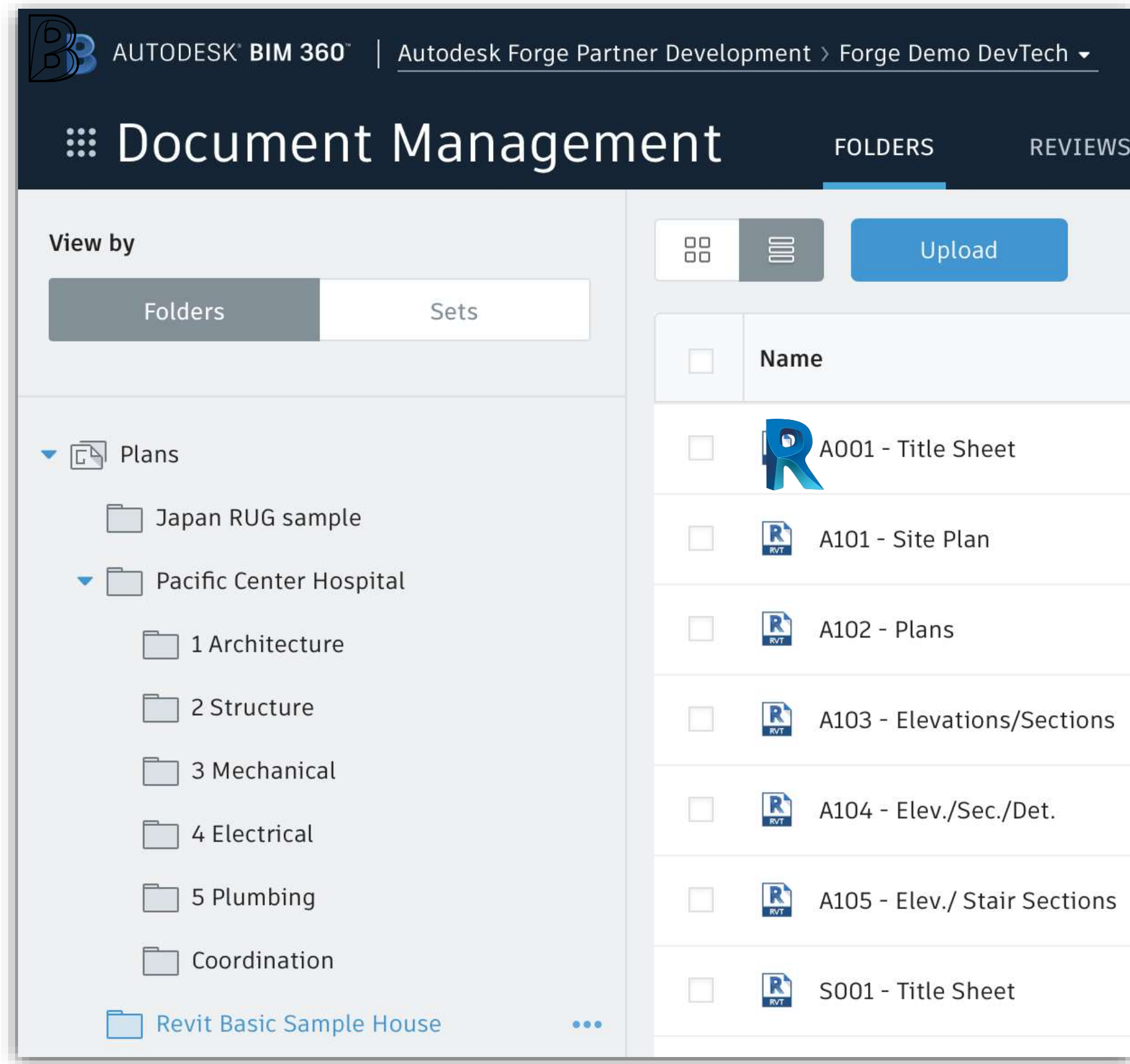


Example: InsiteVR is part of the BIM360 ecosystem

3 Effort: ●

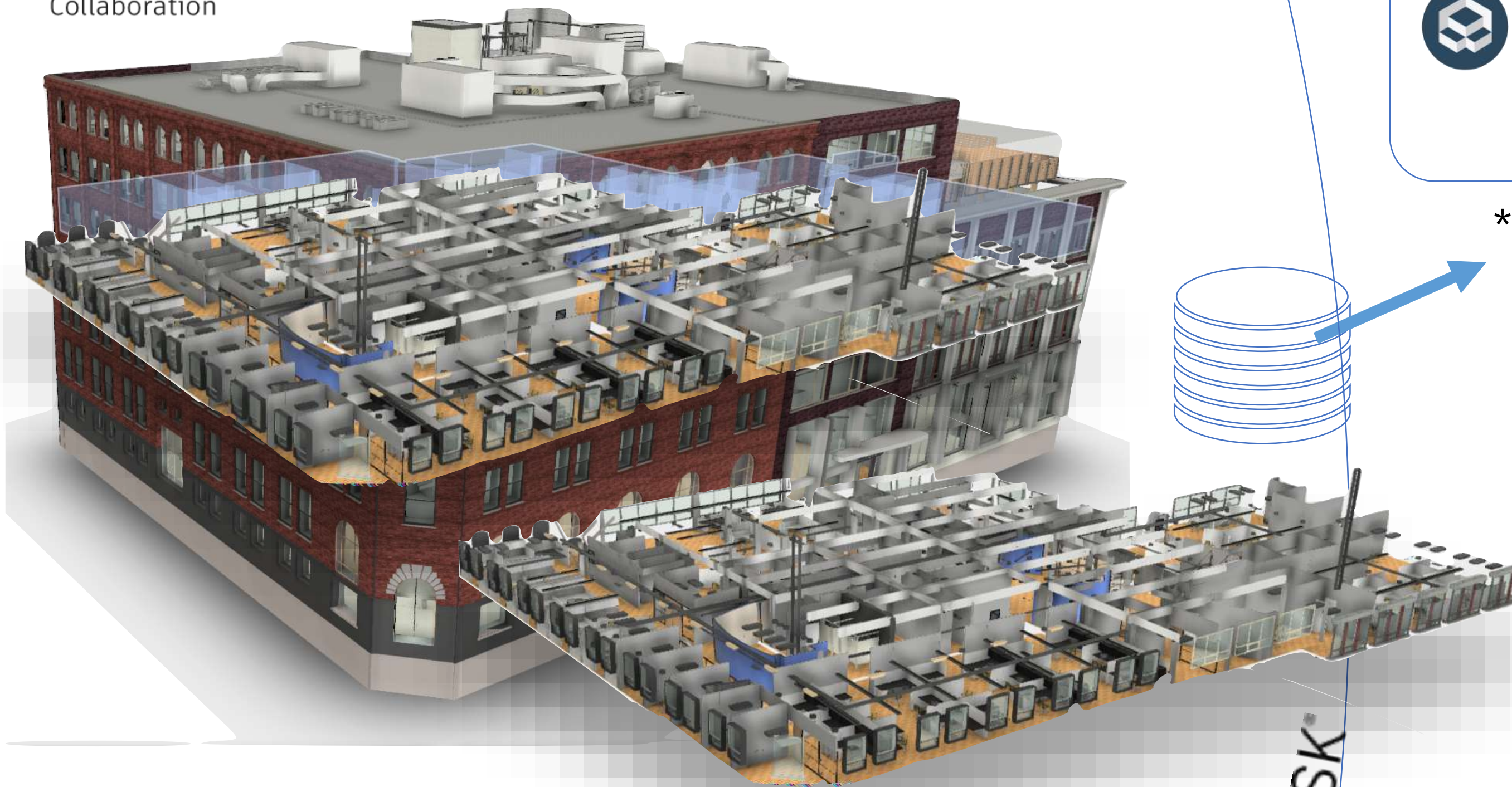
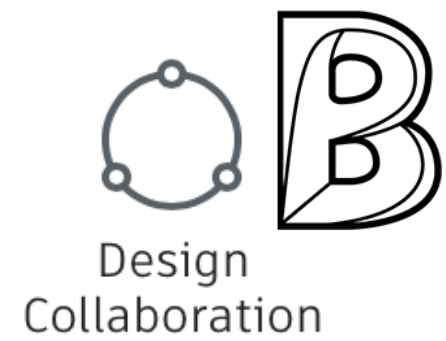


When data changes: sync “offline devices”

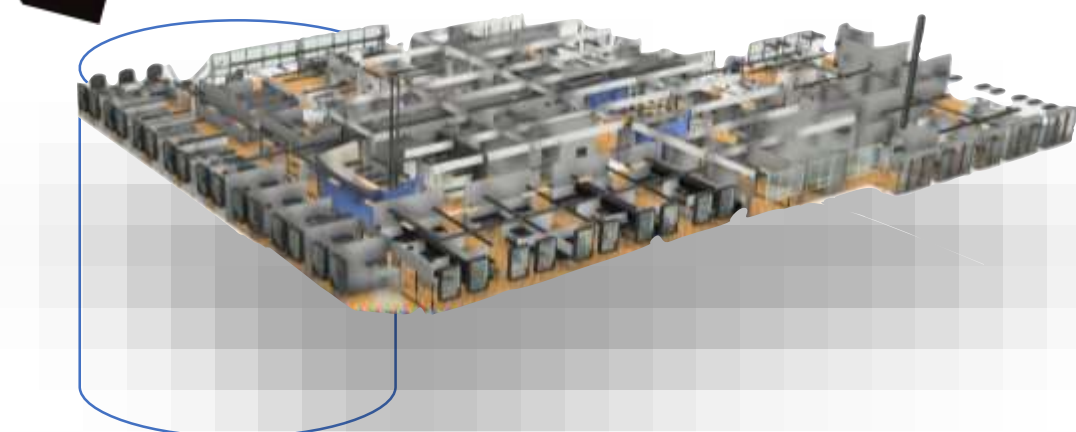
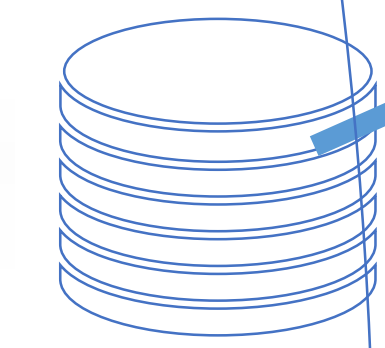


Steps...

Query for a “Spatial Subset” (ie. 4th floor only)



*Spatial query



- View Entire building with BIM360/Navis
- Automatically take a sub-set of the “4th floor”
- Device queries Revit id's, but just the “4th floor”
- Unity app downloads meshes directly from Forge



- + Weak Device can handle huge models
- + Minimal transfer/storage
- + Faster TTLP / FPS

Oculus Quest: The Future of VR

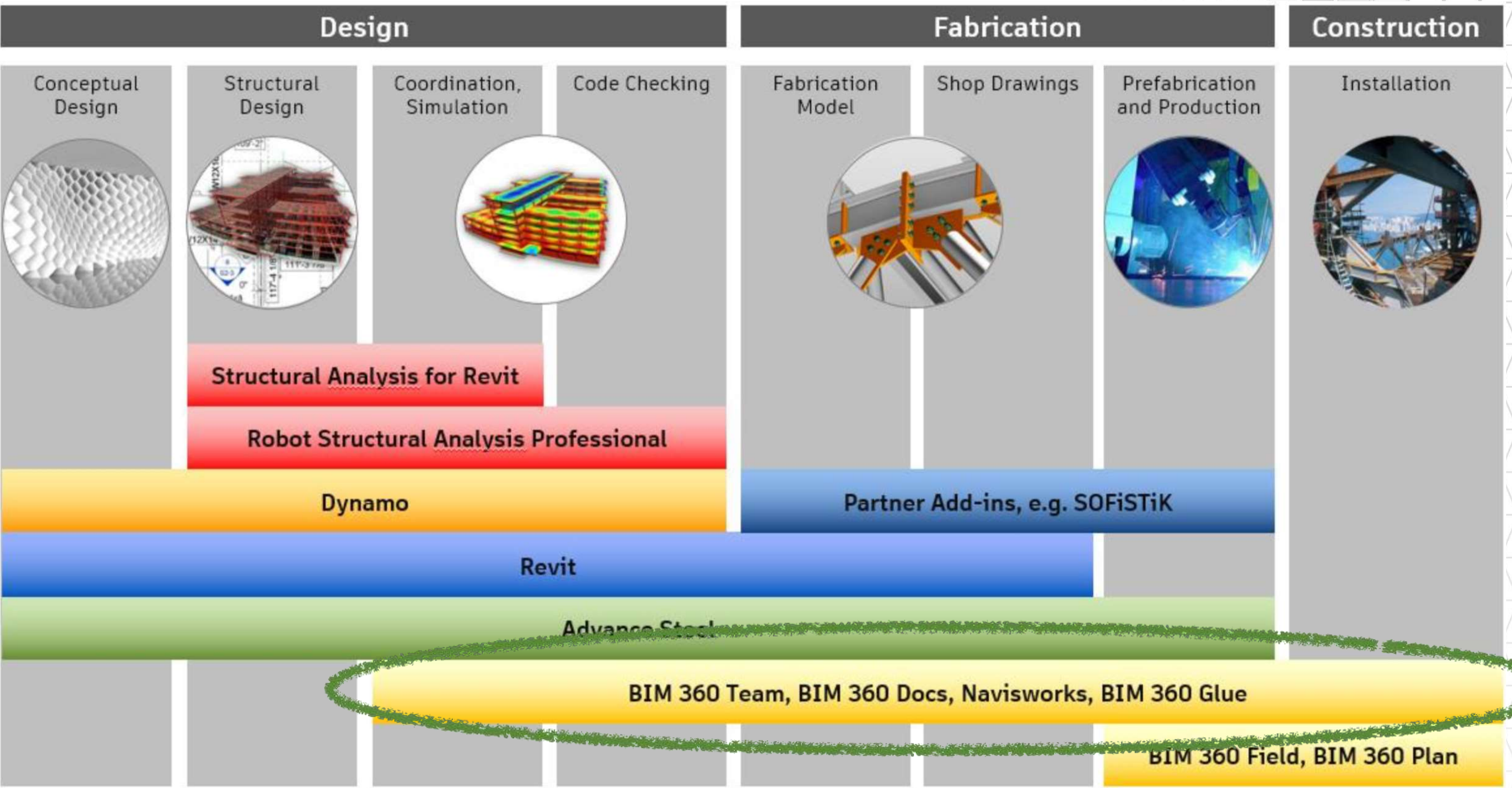
- Standalone: No cables. No PC. No external sensors.
- *60 seconds* to get into your model.
- 6 degrees of freedom (position + rotation).
- \$399 off the shelf.
- Enterprise support available.



Standalone VR has Limitations

Quest runs on a mobile chipset which means it doesn't have a high end GPU for photorealistic rendering. Developers need to optimize content and render pipelines.

VR for construction





Communicating 3D
information is hard.
Doing it poorly is
expensive.



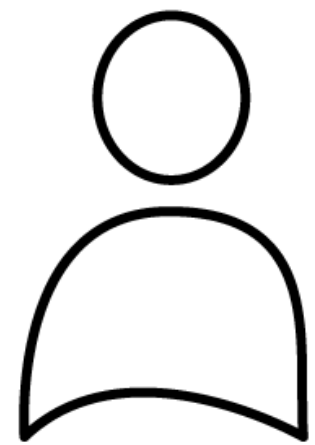
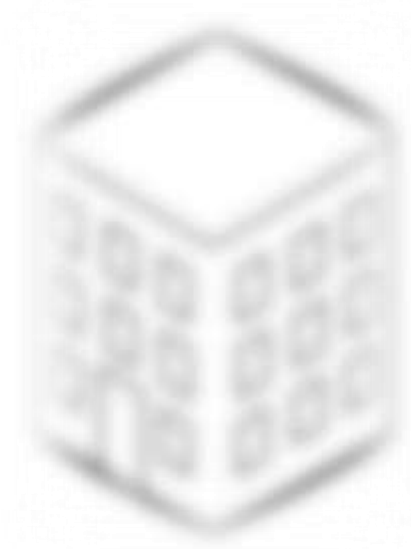
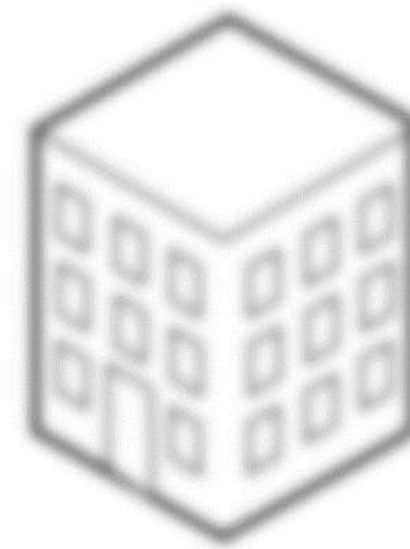
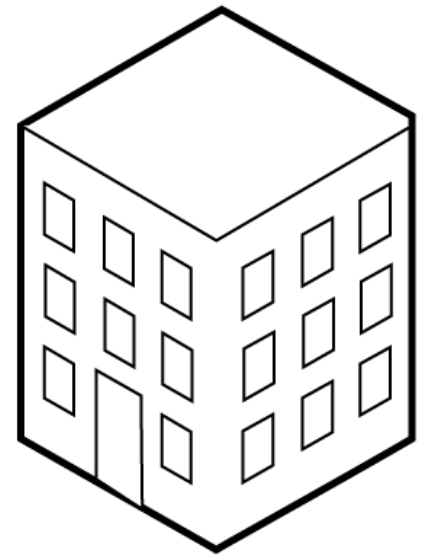
InsiteVR is immersive meeting software for AEC teams.

Our mission is to help construction projects stay **on budget** and **on time** by revolutionizing the way they discuss 3D information.

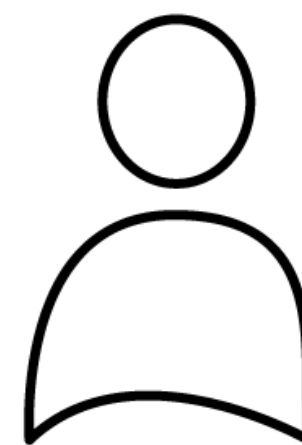


Information Loss Is Expensive

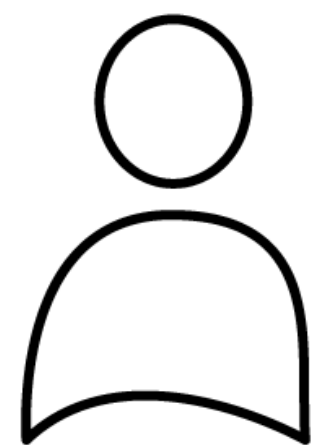
Information hand off is a critical part of the building process, but if communication isn't crystal clear issues will propagate until they're expensive on-site mistakes.



Designers

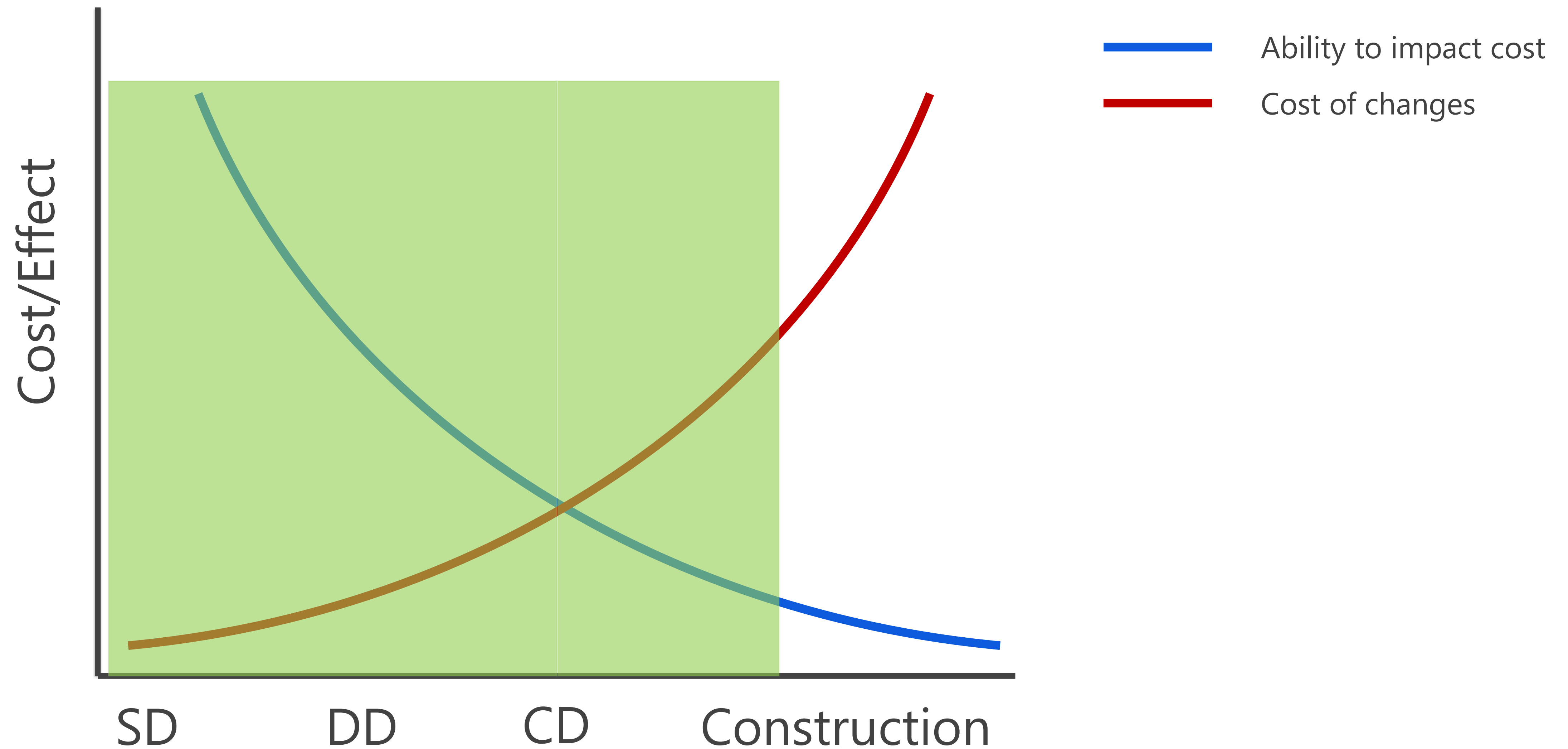


GC



Subs

Find Issues in BIM, Not On Site



The Cost of Information Loss

\$1,080
per RFI

RFIs have a lot of overhead costs in addition to any delays incurred.

20
RFIs per \$1 M

The bigger the project the more RFIs.

48%
of rework

A large portion of rework is due to miscommunication and poor project data.

14
hrs / week

Teams spend a lot of time on avoidable issues and searching for info.

Sources:

1. Hughes et al, *Impact & Control of RFIs on Construction Projects*, Navigant Construction Forum, 2013
2. <https://blog.plangrid.com/2018/08/fmi-plangrid-construction-report/>

Virtual Reality Review Meetings

 AUTODESK® BIM 360™ +  InsiteVR



InsiteVR for BIM 360

DIRECT BIM 360 DOCS INTEGRATION

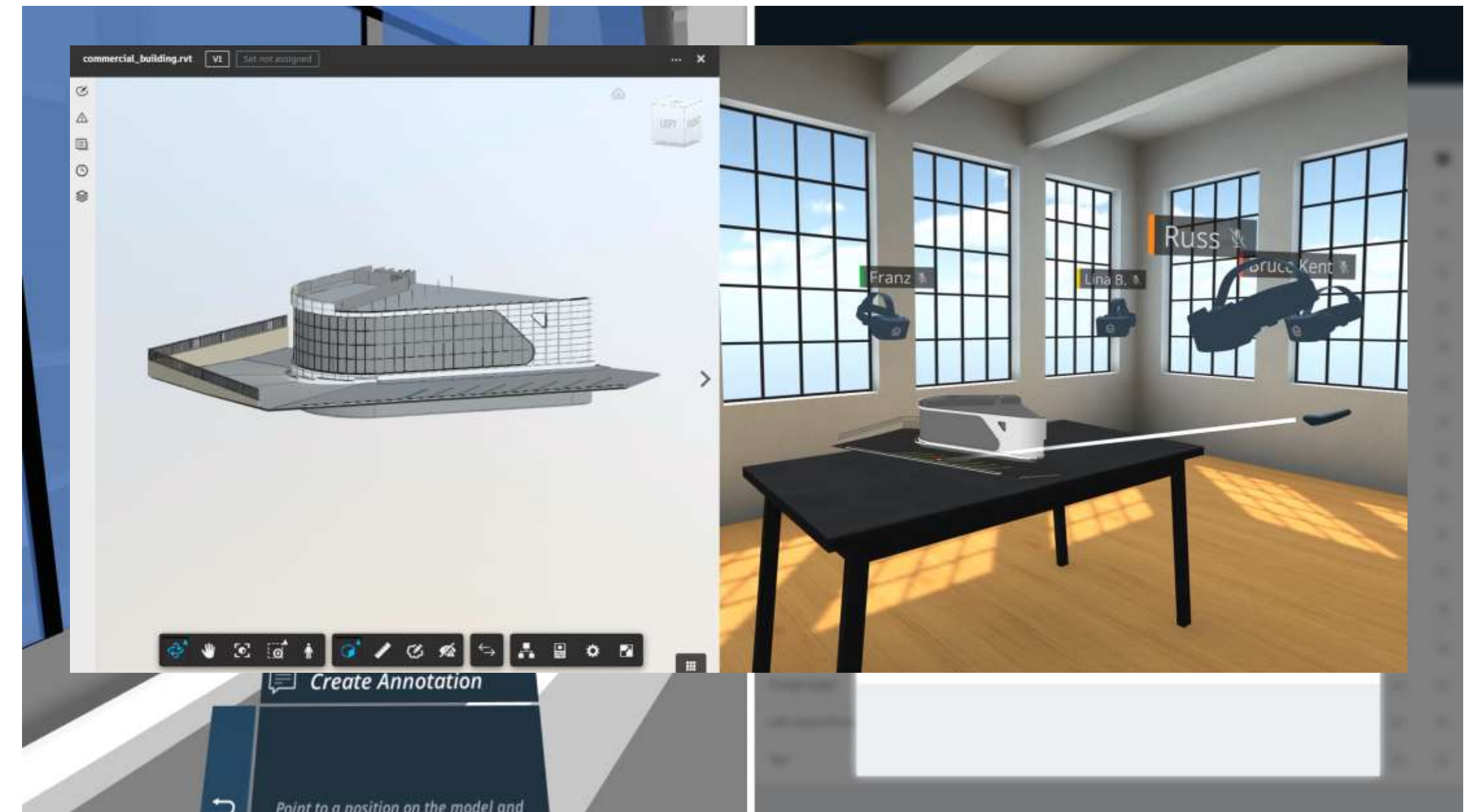
Automatic model syncing without exports. Review over 60 formats supported by BIM 360. VR directly linked to a single source of truth.

ACTIONABLE RESULTS

Speech-to-text VR annotations are automatically synced to BIM 360 issues to ensure actionable results from VR. Also available as PDF and CSV reports.

SIMPLE VR MEETINGS

Join meetings with a 6 digit code. Stay in control with host tools. Sketch, measure, and take screenshots of issues.





Step 1

Host starts meeting

Step 2

Up to 20 people join meeting remotely.

Step 3

Everyone reviews BIM 360 together, in VR

Case Studies

Healthcare Design

What: 142,000-SF healthcare expansion and renovation

Where: Texas Health Hospital Rockwall

How: InsiteVR + Oculus Quests + BIM 360 + Revit

Who: Project architect, equipment consultants, nurses, doctors, and hospital executives

When: VR review meetings during Design Development

- No cardboard mock ups, but still able to review **as a group**
- Equipment decisions in **under 10 minutes**
- **Increased confidence** in owner decisions
- VR meetings directly from BIM 360 hub
- Spaces included: OR, Patient Room, C-Section, Kitchen

Perkins&Will

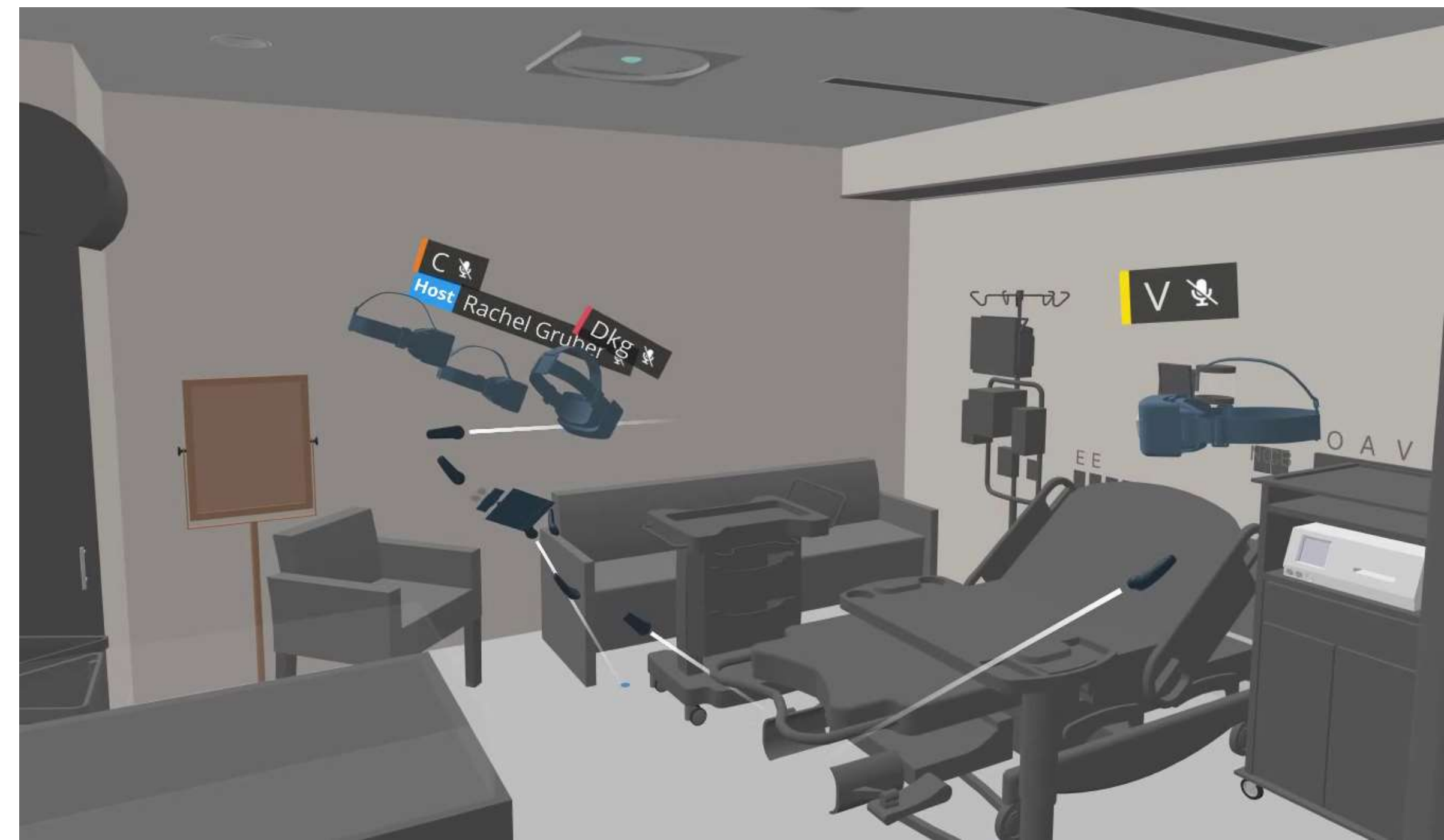




Photo Credit:
Rachel Gruber, Perkins and Will

Healthcare Construction Case Study: New Construction in NC

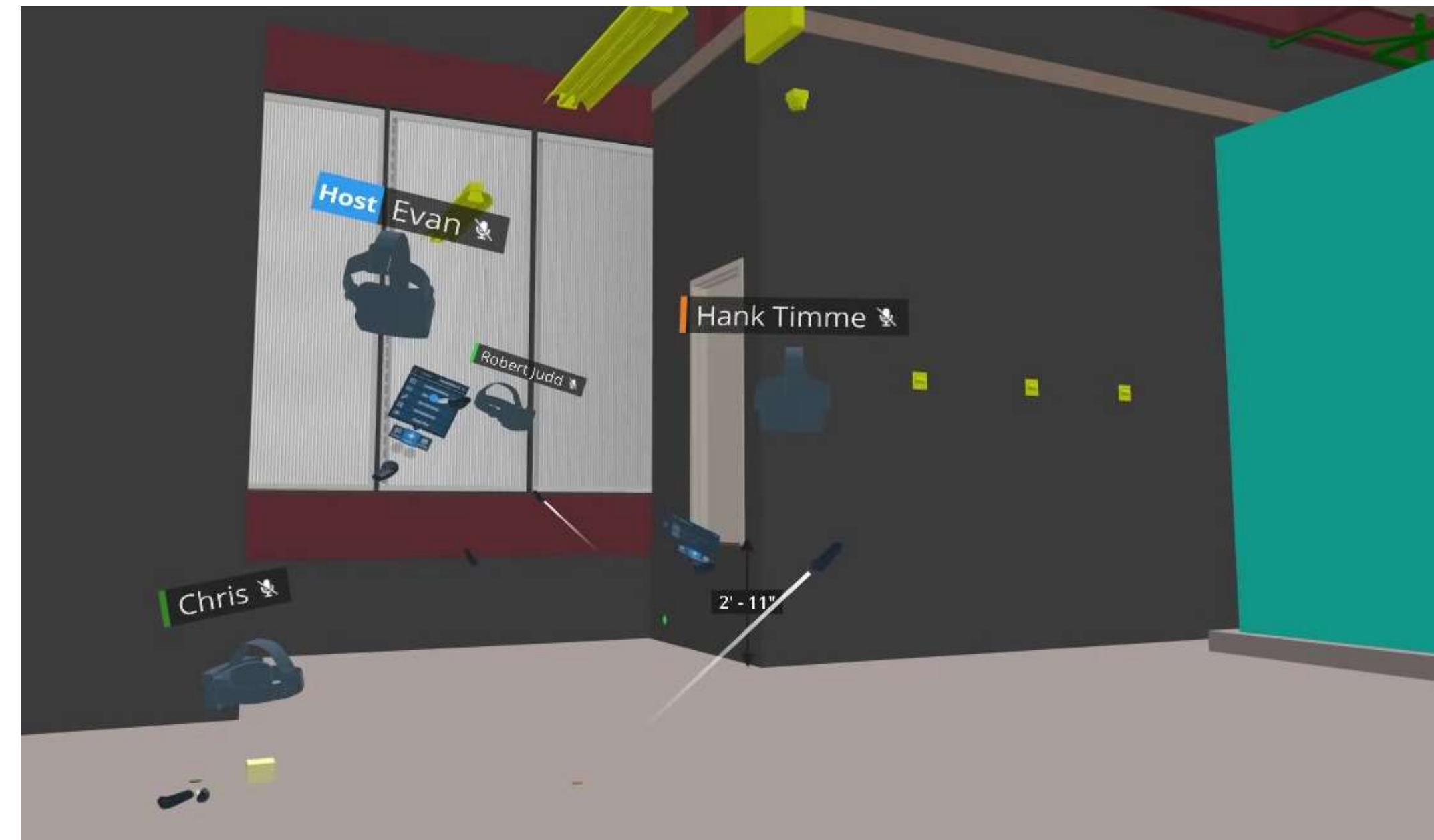
What: 335,000-SF new hospital construction

How: InsiteVR + Oculus Quests + BIM 360 + Navisworks

Who: Sr. Superintendent, Sr. PM, VDC Manager,
VDC Engineer, Project Architect

When: Bi-weekly VR coordination meetings during preconstruction

- Prevented an average of **3 RFIs/hr** in VR
- Identified maintenance accessibility issues
- Helped superintendent **anticipate issues and potential rework**
- InsiteVR meetings improved collaboration with architect in development of final construction documents



Healthcare Construction Case Study: Hospital Expansion

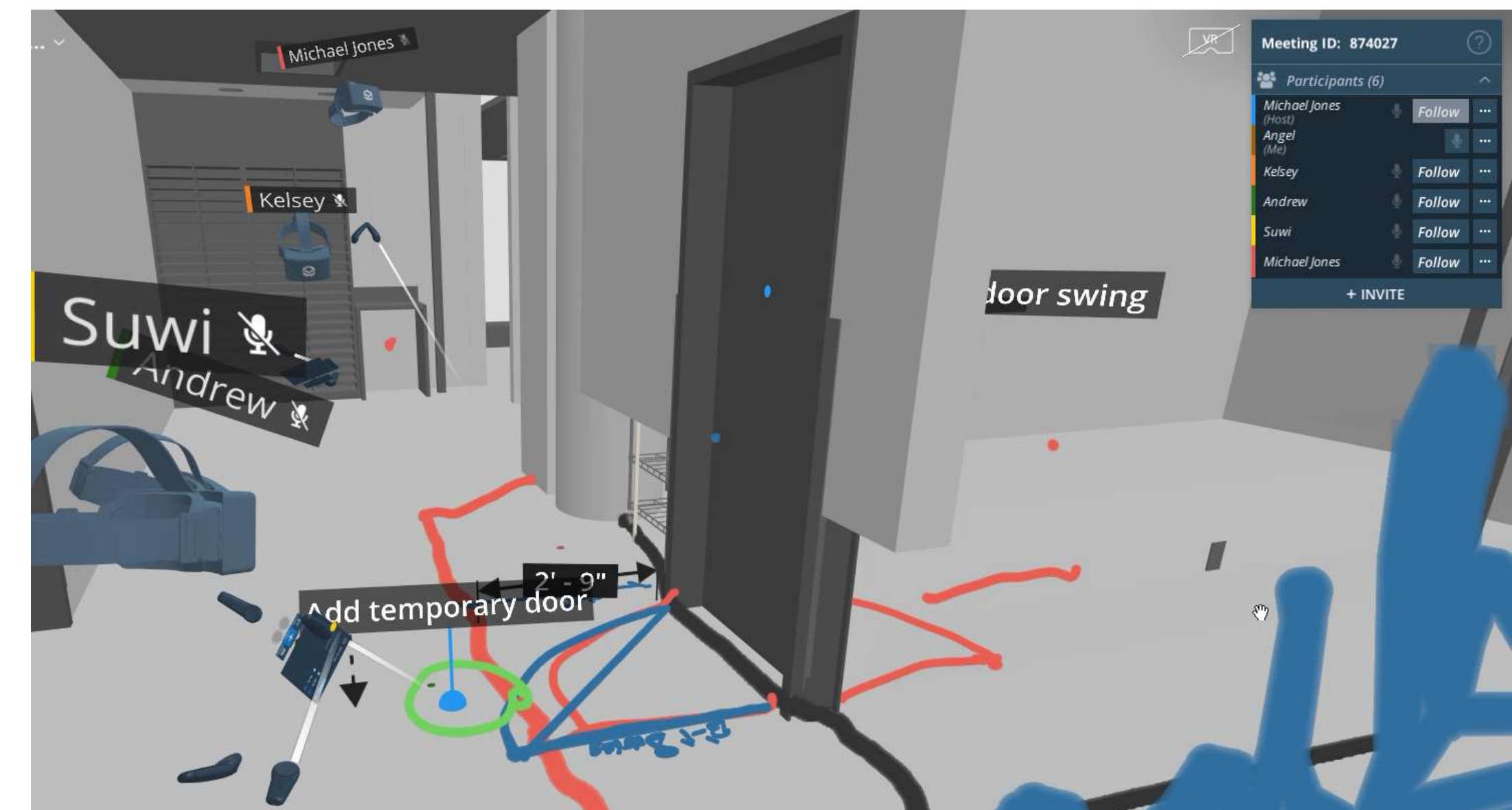
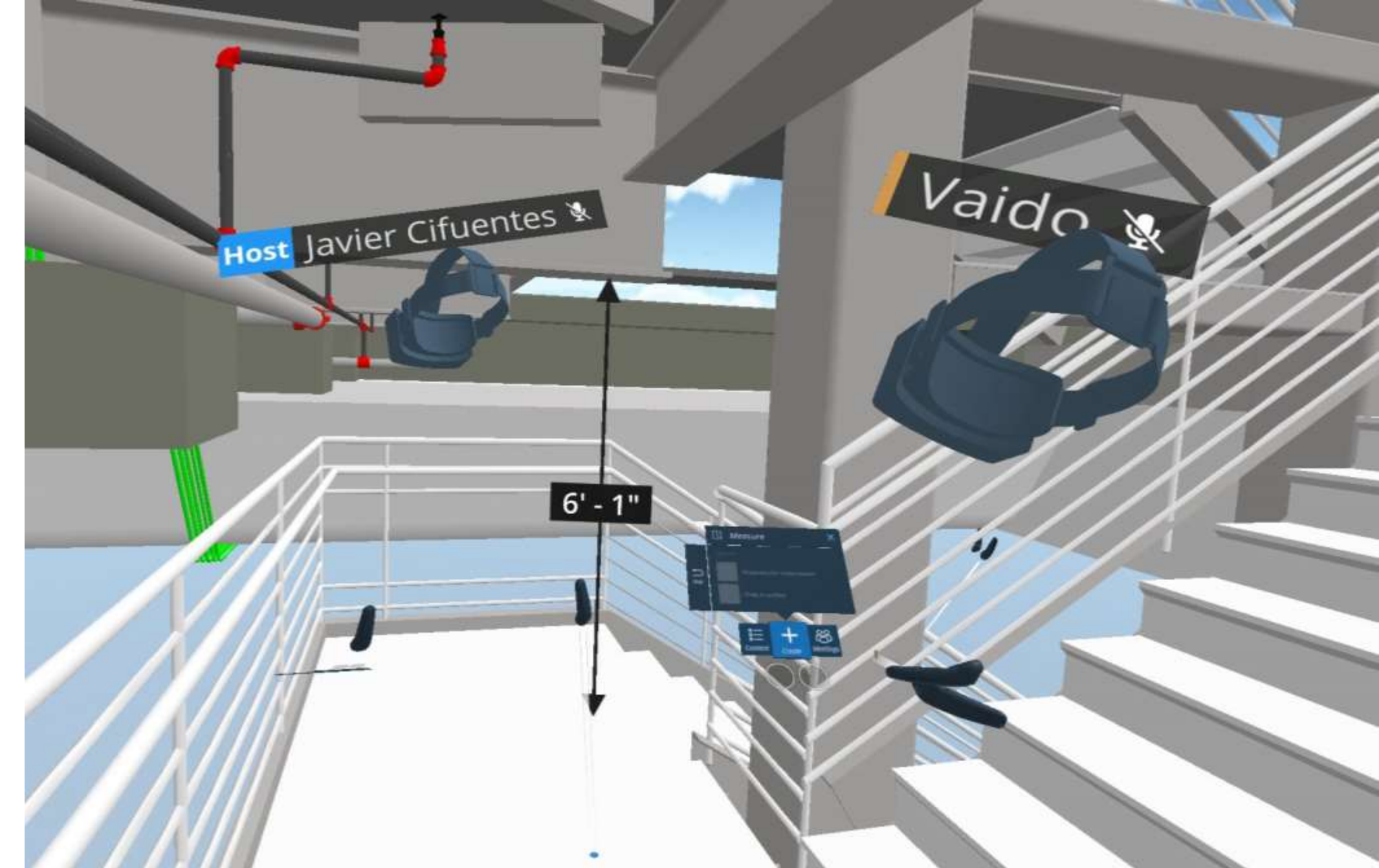
What: 100,000-SF hospital expansion

How: InsiteVR + Oculus Quests + BIM 360 + Revit

Who: Precon Engineer, MEP Estimator, VDC Manager, Precon Technology Manager

When: Weekly VR meetings during preconstruction estimation

- Infection control risk assessment (ICRA) between 3 different offices
- Improved accuracy of estimate before submitting GMP
- Identified maintenance accessibility issues



Aviation Case Study: Airport Expansion

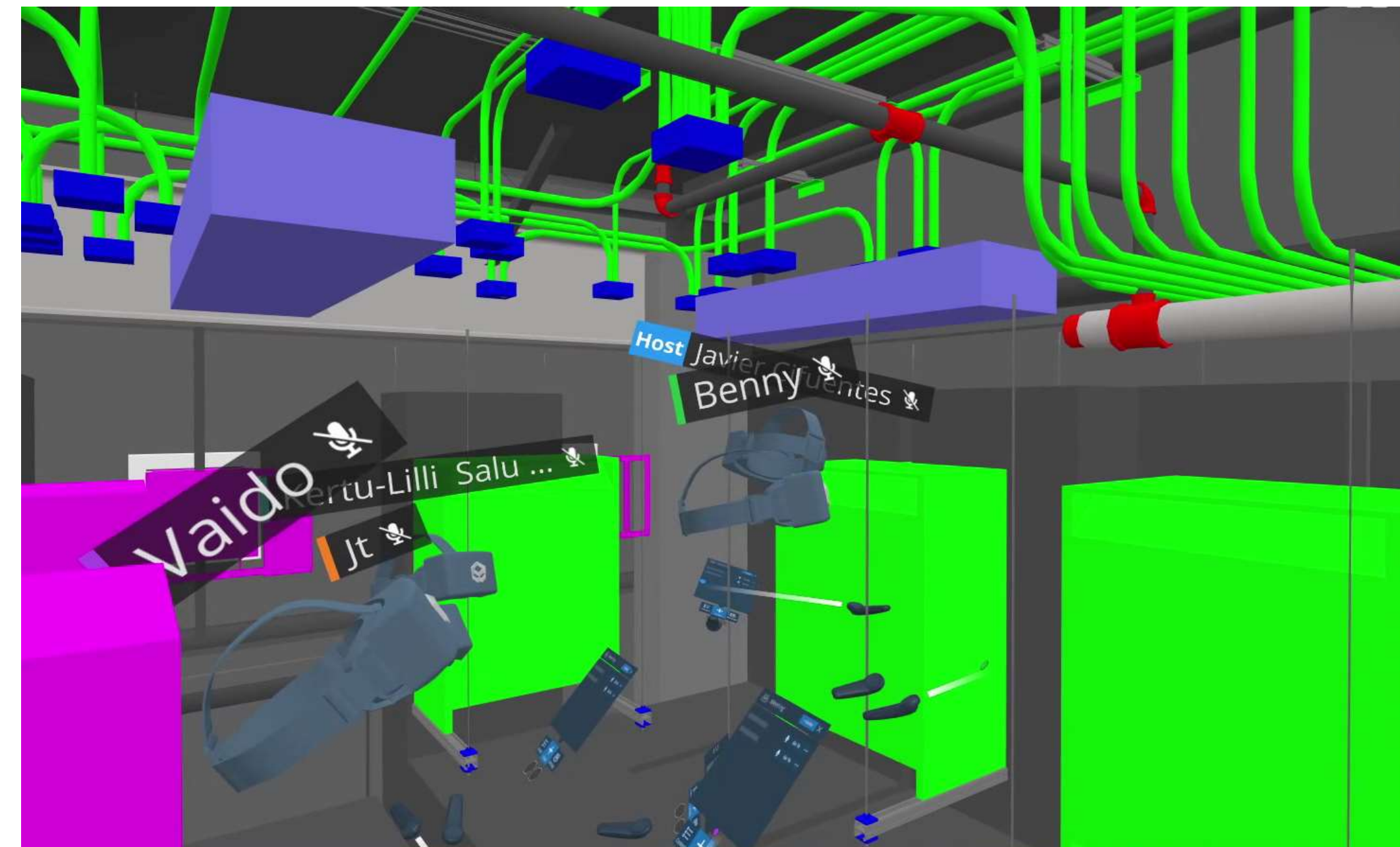
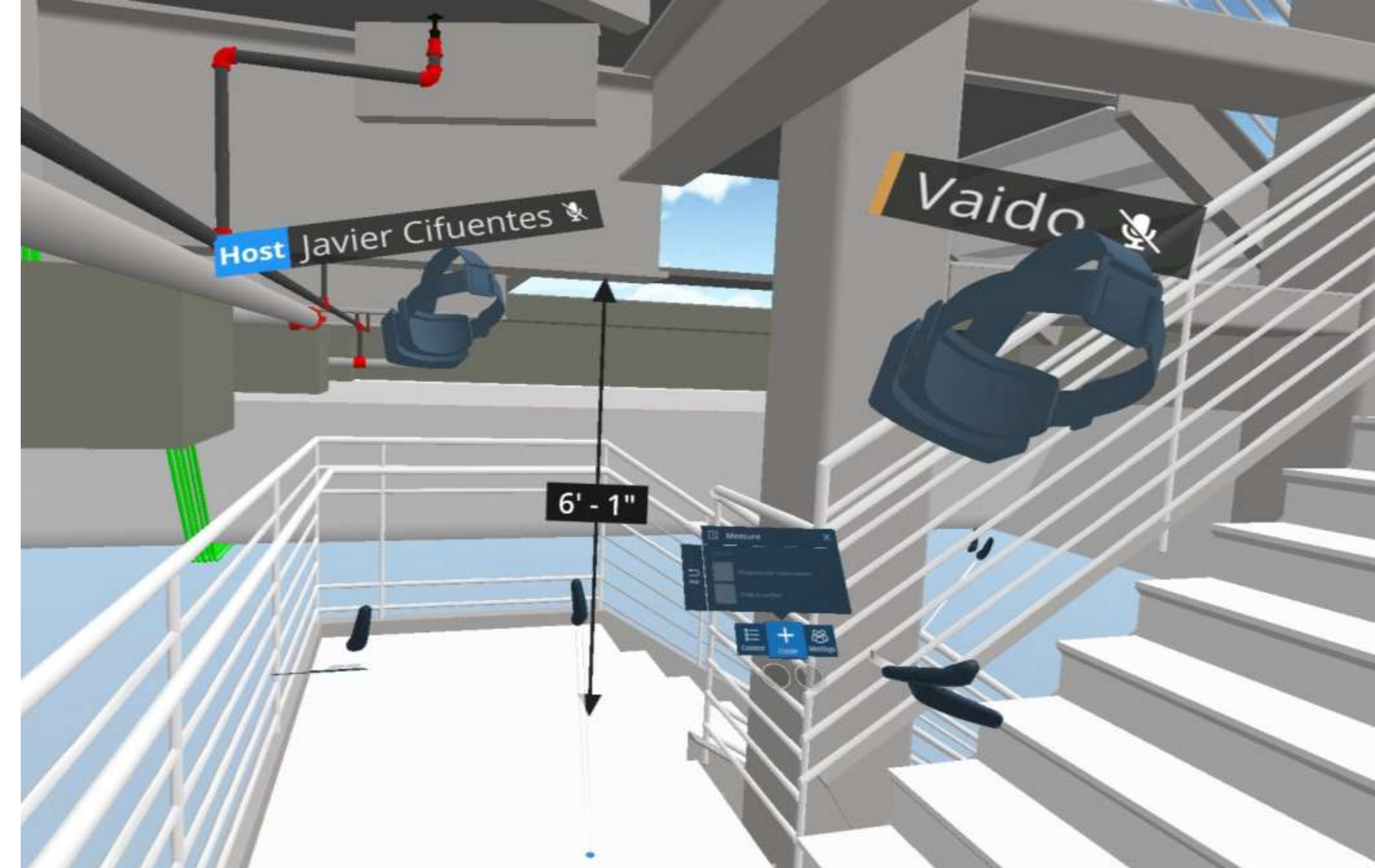
What: Design-build airport construction

How: InsiteVR + Oculus Quests + BIM 360 + Navisworks

Who: Sr. PM, Design Build Manger, Project Engineer, VDC Manager

When: Bi-weekly VR coordination meetings

- Prevented a **2 month** delay
- Identified issues not flagged by Navis clash detection
- Located three areas with potential risk for rework and RFIs
- Improved quality of as-built BIM deliverables





Single source of truth



Easy collaborative VR



Easy VR hardware

Building Blocks for Success

Requirements for VR with Results

VR SO EASY ANYONE CAN USE IT

- Teams shouldn't have to rely on IT to use VR.
- VR is for more than the BIM/VDC specialists.
- The more people in VR, the bigger the ROI.

ACTIONABLE RESULTS

- In VR, teams find issues with real impact.
- Issues should be accessible outside of VR.
- Projects already have issue tracking workflows, we just help them find more issues.

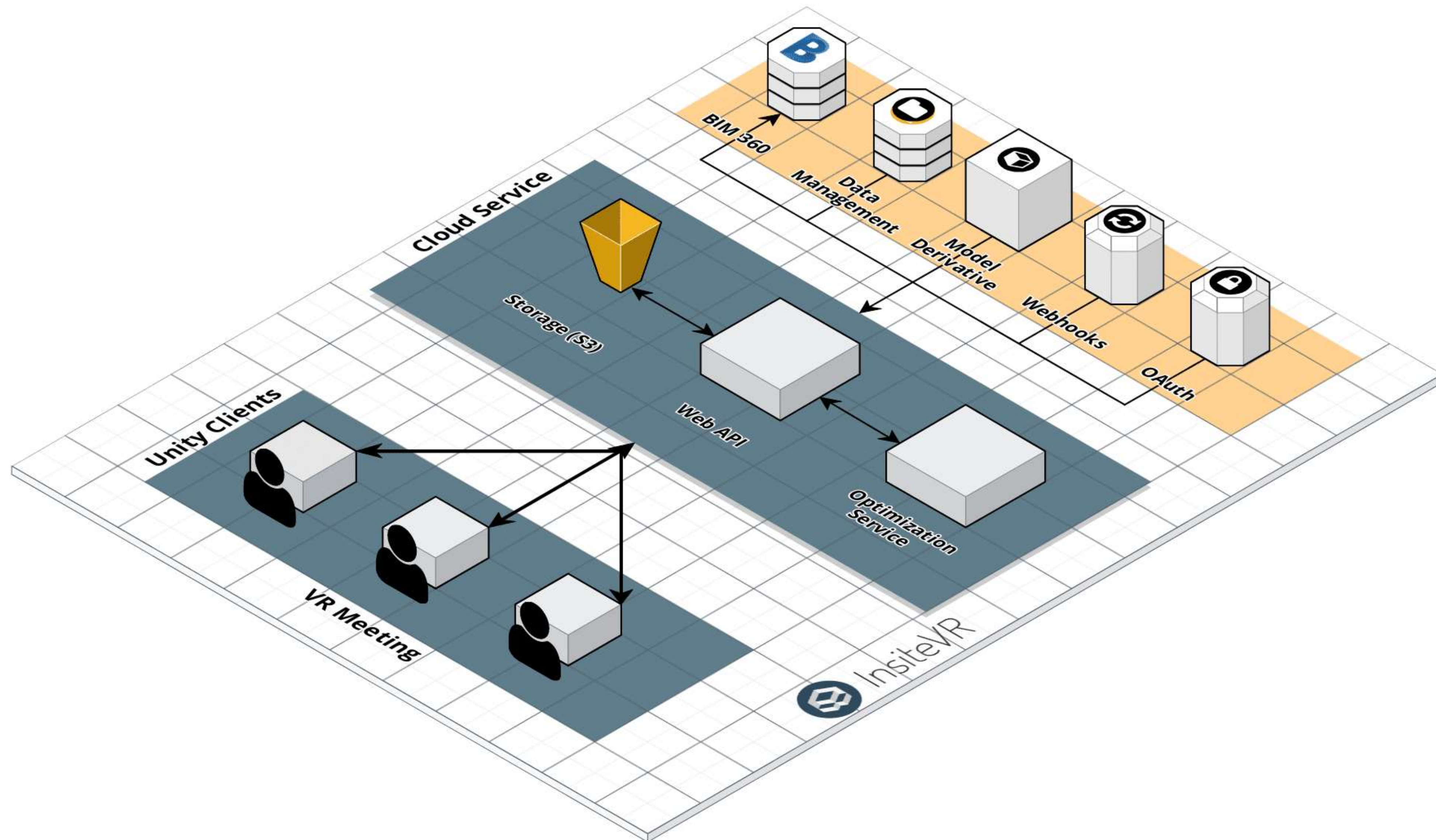
DATA INTEGRITY

- No "freezing" models to prepare them for VR.
- Avoid tracking another version of the model.
- Geometry + BIM metadata in VR

NO EXTRA WORK

- No game engine work.
- No file transfers.
- Get to the real work quickly: find issues.

BIM 360 to VR: How It Works



Making It Work: Forge APIs

OAUTH

DATA MANAGEMENT

WEBHOOKS

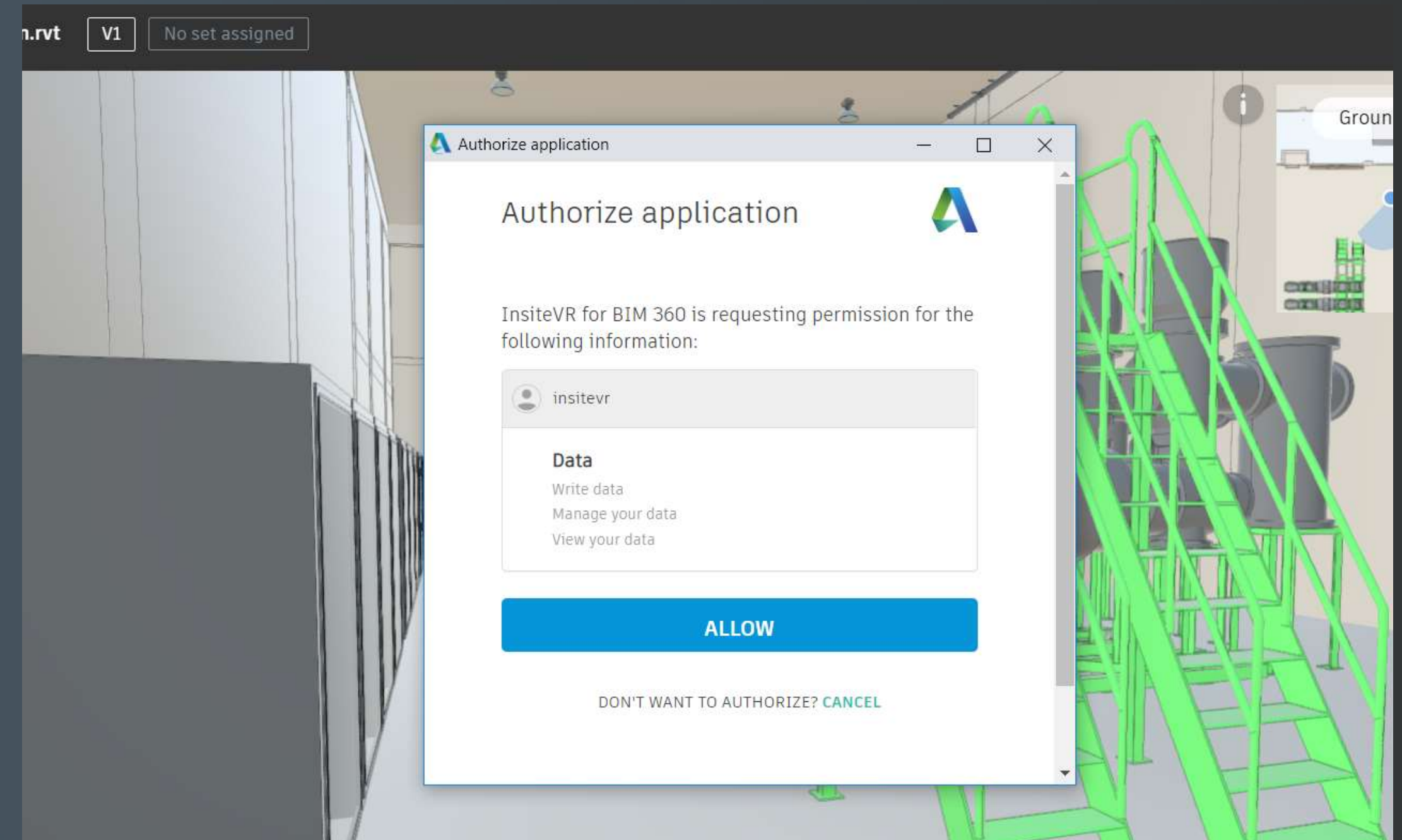
BIM 360

MODEL DERIVATIVE

Making It Work: Forge APIs

OAUTH

Users must authenticate BIM 360 accounts so InsiteVR can retrieve and publish data on their behalf.

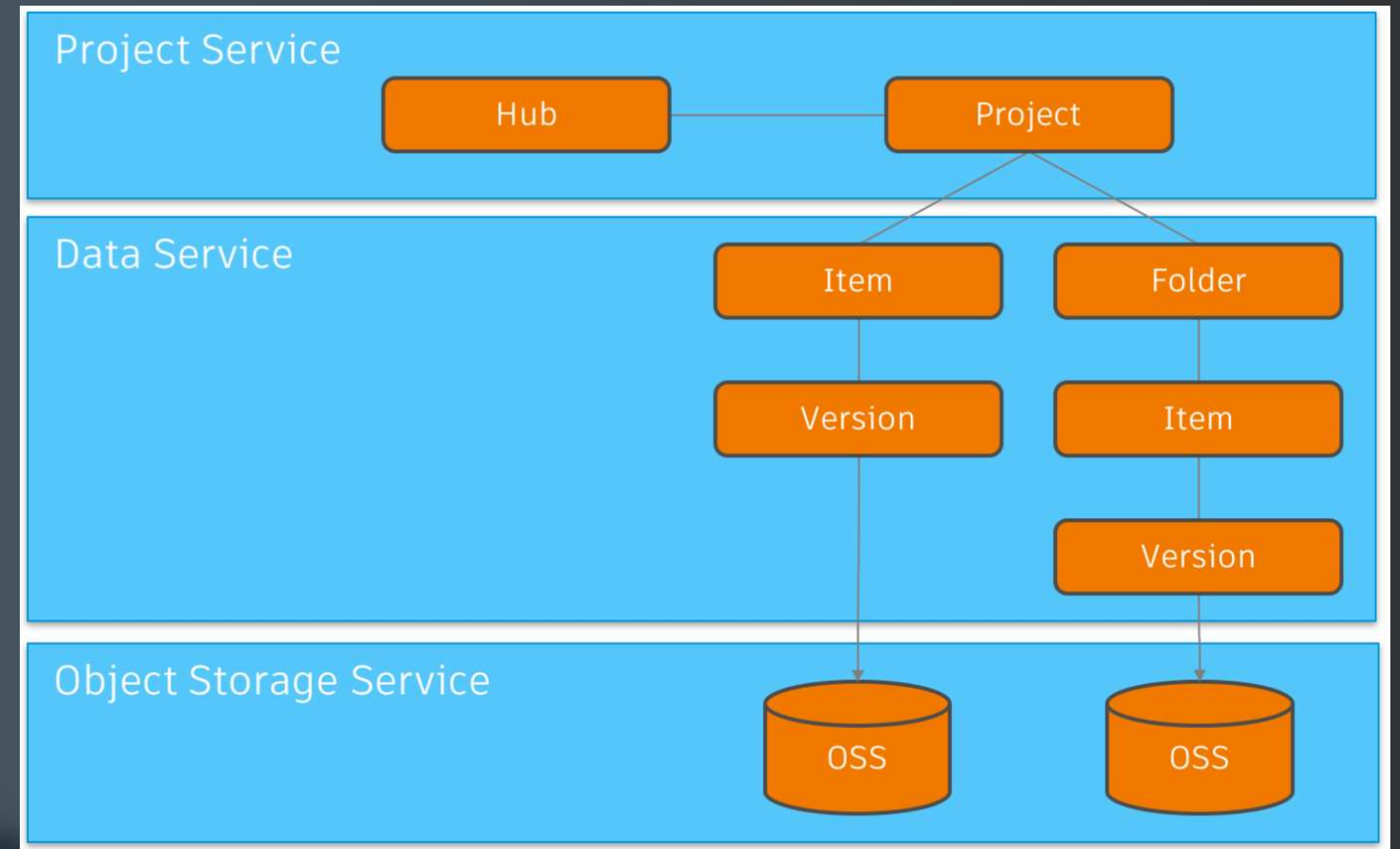


Making It Work: Forge APIs

OAUTH

DATA MANAGEMENT

InsiteVR can retrieve project information using the data management API. Gives InsiteVR access to *hubs*, *projects*, and *folders*.



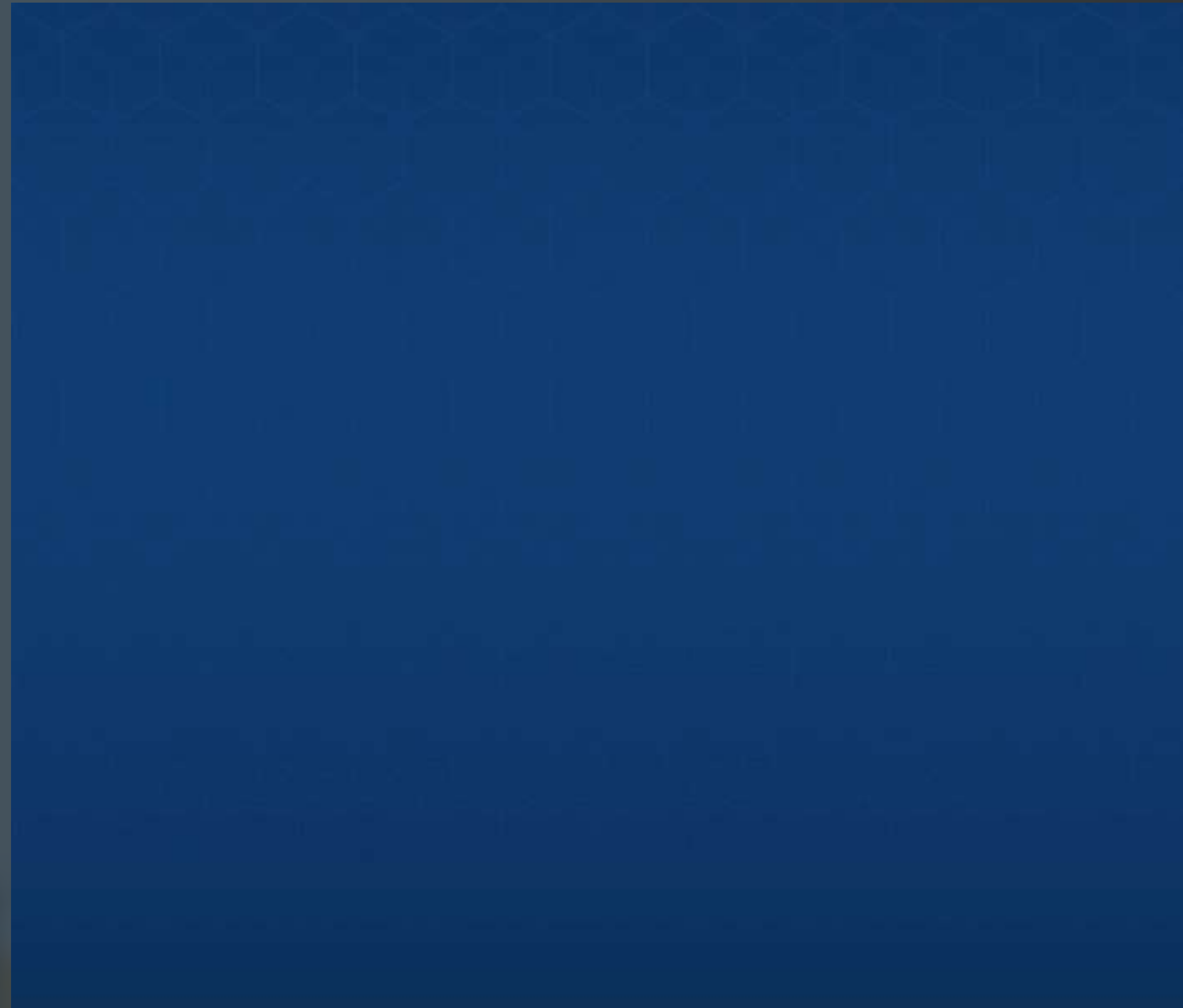
Making It Work: Forge APIs

OAUTH

DATA MANAGEMENT

WEBHOOKS

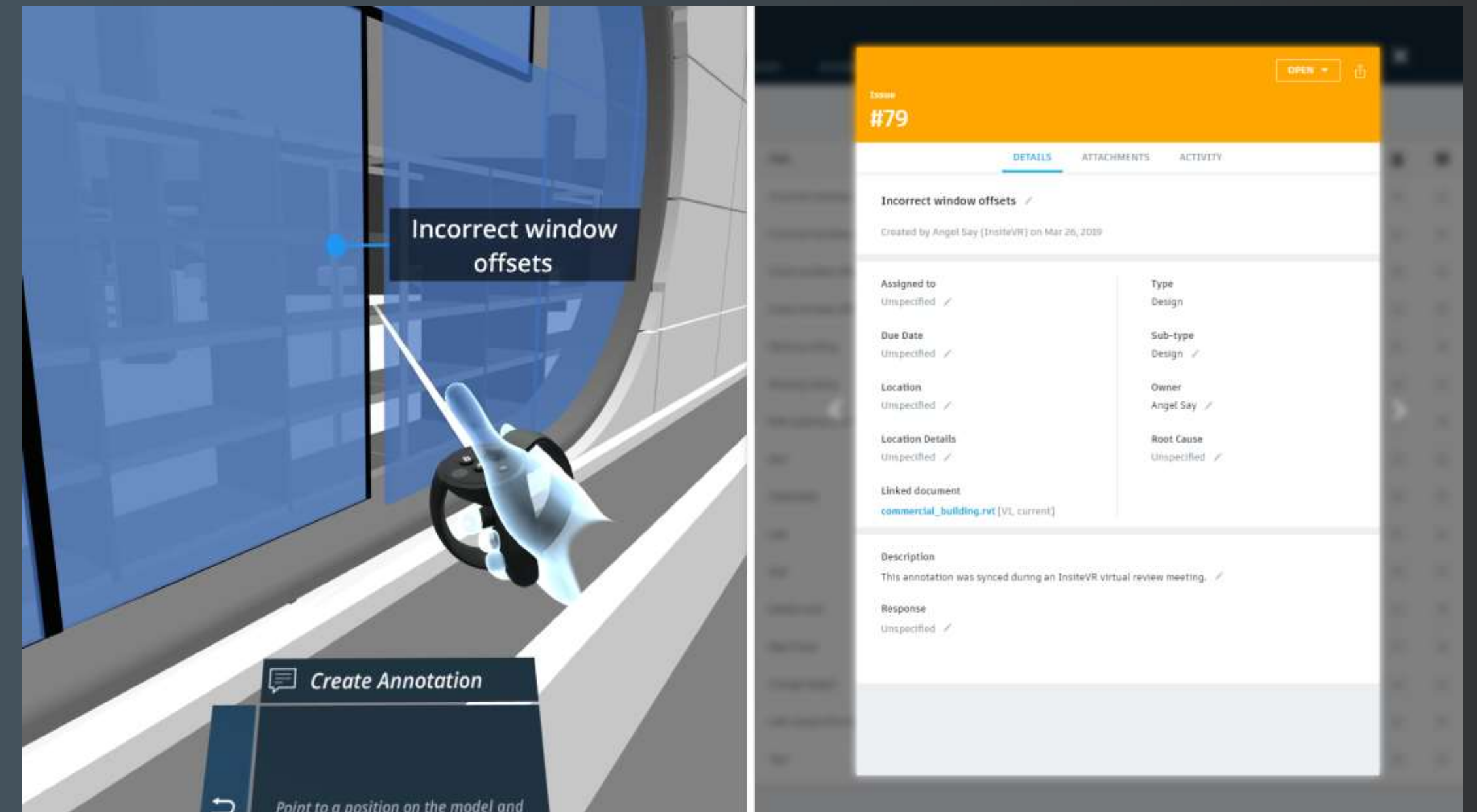
Allows InsiteVR to listen to Forge Data Management events and retrieve the latest version of a model when published.



Making It Work: Forge APIs

OAuth
DATA MANAGEMENT
WEBHOOKS
BIM 360

Create BIM 360 issues directly from within VR with InsiteVR's speech-to-text annotations.





Live BIM 360 Issues Demo

Making It Work: Forge APIs

OAUTH

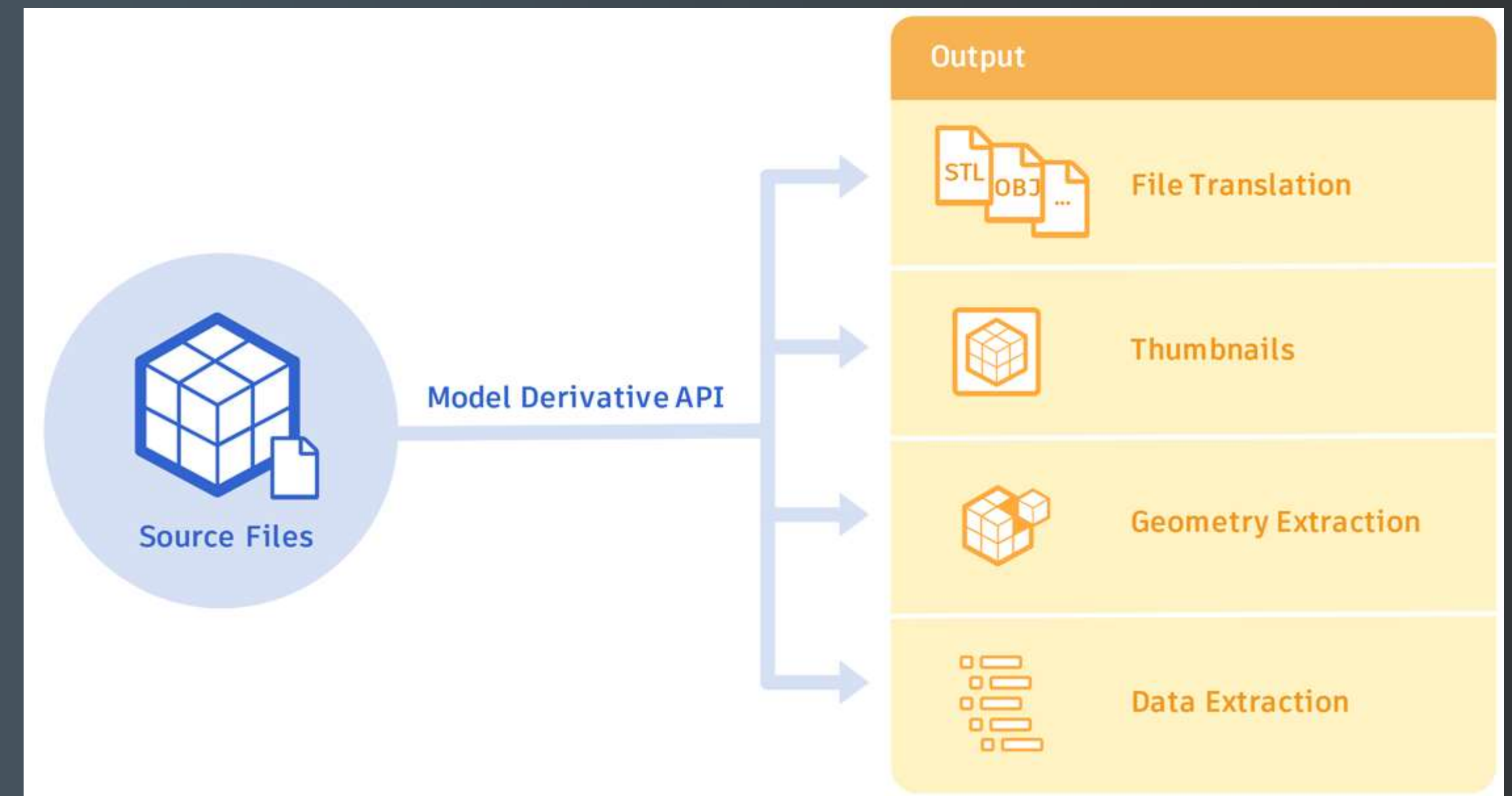
DATA MANAGEMENT

WEBHOOKS

BIM 360

MODEL DERIVATIVE

Provides geometry for rendering in VR meeting and metadata to inspect element properties.



The Single Button UX

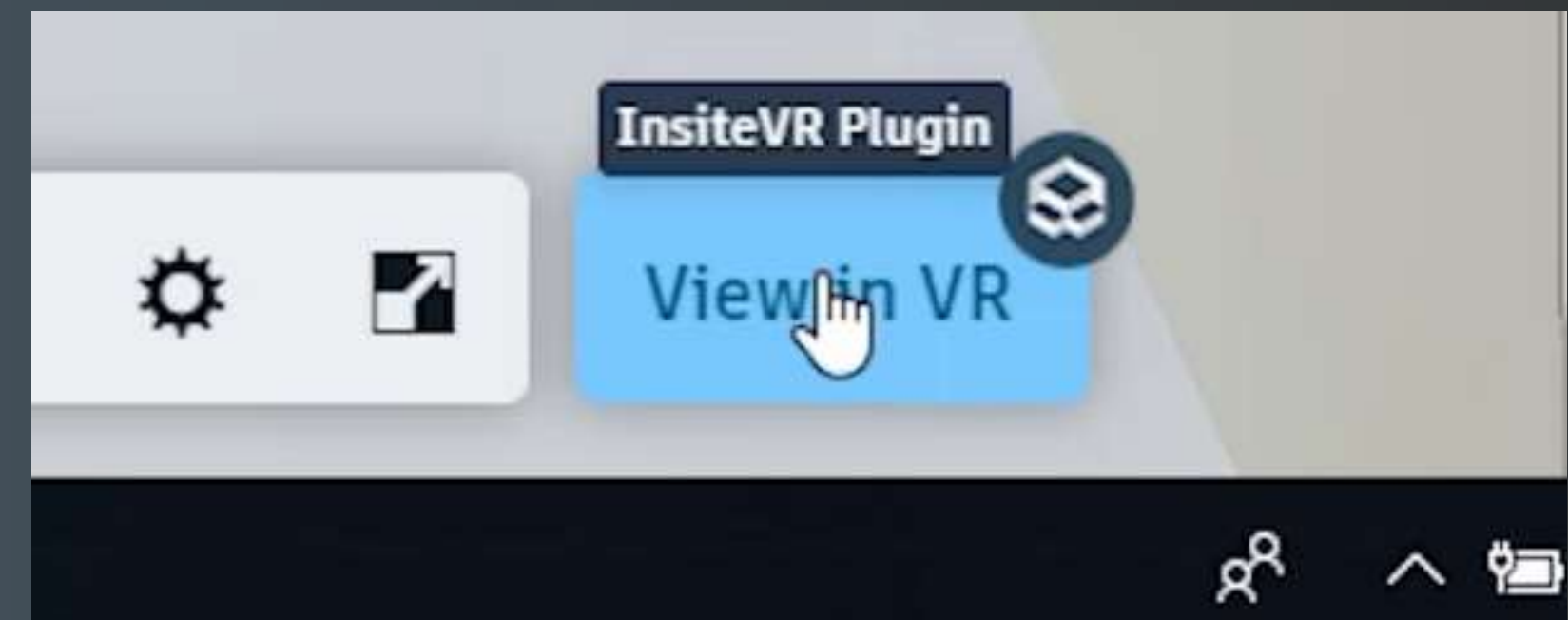
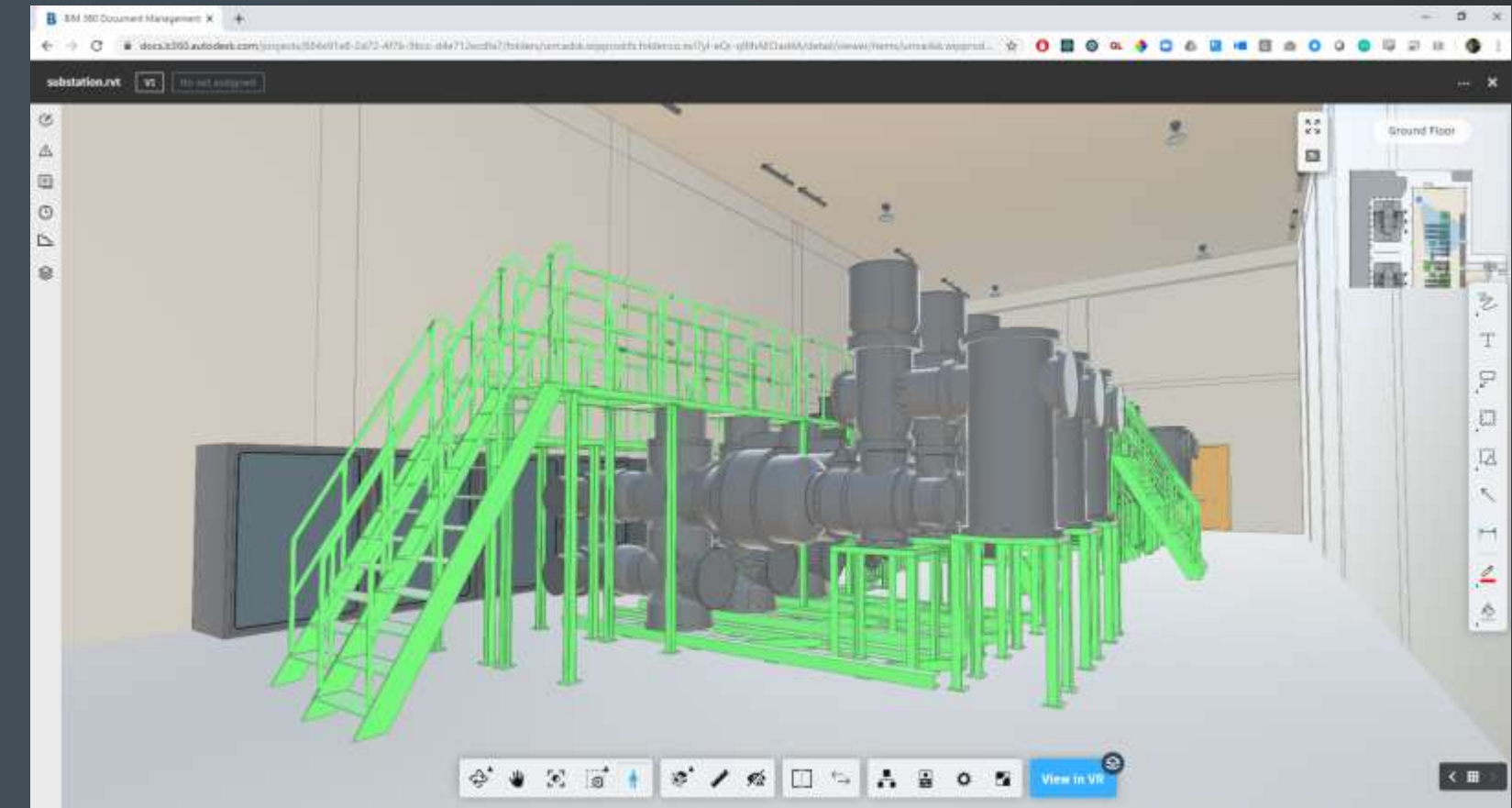
Challenges:

- No need for Revit, Navis, etc. installed.
- 60 seconds to review issues in VR.
- V1 was the LMV embedded into the InsiteVR desktop app using Electron.
- Wanted to deviate from existing workflows as little as possible.



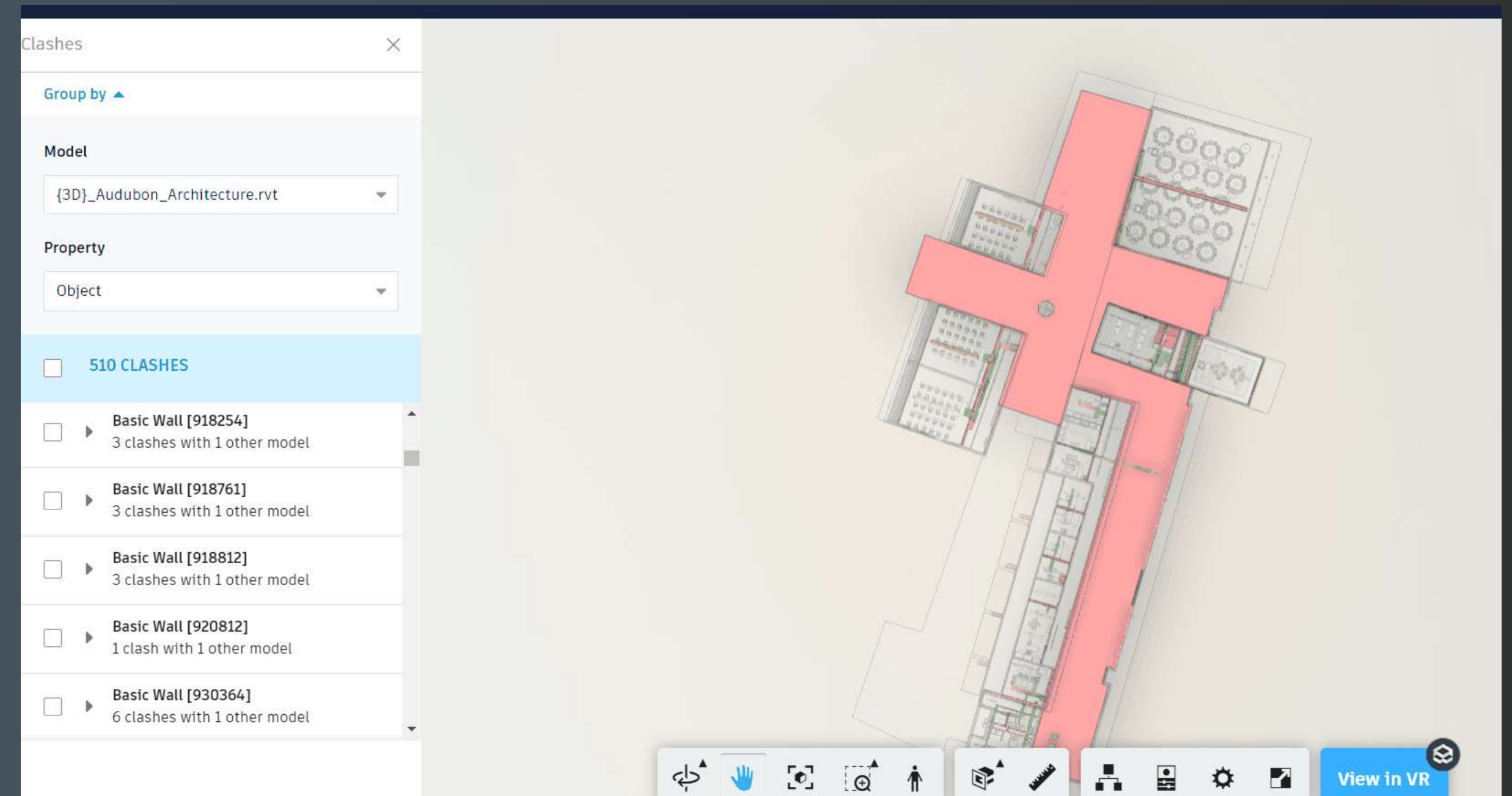
The Single Button UX

- Added a “View in VR” extension to the Large Model Viewer (LMV).
- Added to BIM 360 via a Chrome Extension. Working with Autodesk to directly integrate.
- **Any** model opened in BIM 360 docs can be reviewed in a VR meeting using a single button.

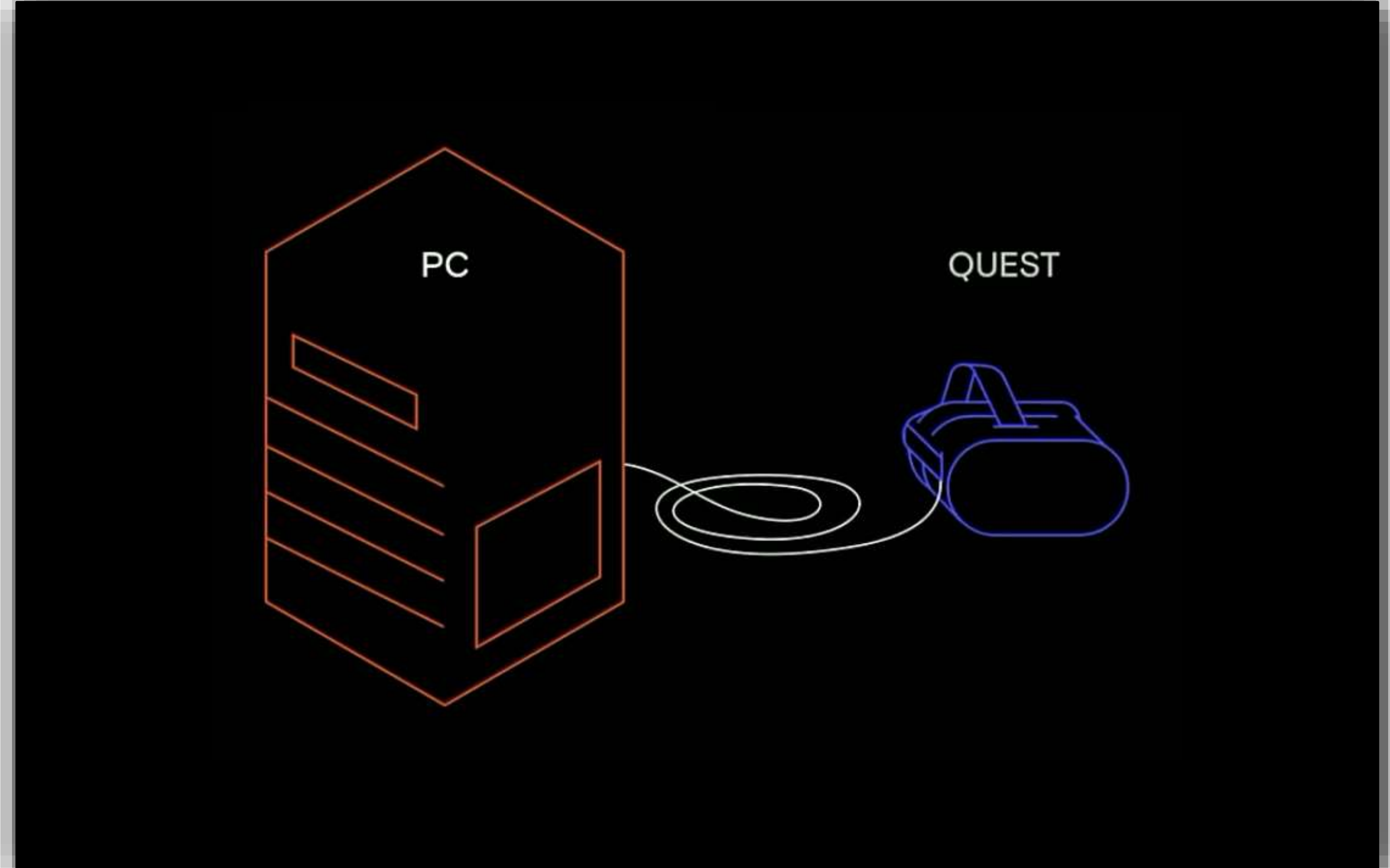


What's Next?

- BIM 360 Model Coordination integration. Review clashes instantly in VR.
- Faster model syncing between BIM 360 and InsiteVR.
- Improved Oculus Quest experience.




Oculus Link



Hand Tracking

<https://www.youtube.com/watch?v=2VkO-Kc3vks>





InsiteVR has built a solution
...so that you don't have to.

- ✓ VR so easy anyone can use it
- ✓ Data integrity
- ✓ Actionable results
- ✓ No extra work

Forge DevCon VR Zone

<https://www.youtube.com/watch?v= QxeEs0d7Rs>



Thank you!

Follow us on Twitter:
[@insitevr](https://twitter.com/insitevr)

Learn more on our website:
www.insitevr.com

Please fill out the speaker survey!