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

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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

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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
Forge Accelerator

Boston, USA

Feb 4-8

What is an Accelerator?
Data Prep

Trends in “Large Models”
FBX/Manual Pipelines

The custom AR/VR experience development pipeline of today overview
Example: InsiteVR is part of the BIM360 ecosystem
When data changes: sync “offline devices”

- Efficient Sync
- Calculate Delta
- Snapshot v1 “Large Federated Project”
Query for a “Spatial Subset” (ie. 4th floor only)

- 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

- Design
  - Conceptual Design
  - Structural Design
  - Coordination, Simulation
  - Code Checking

- Fabrication
  - Fabrication Model
  - Shop Drawings
  - Prefabrication and Production

- Construction
  - Installation

- Tools
  - Structural Analysis for Revit
  - Robot Structural Analysis Professional
  - Dynamo
  - Revit
  - Advance Steel

- BIM 360
  - Team, BIM 360 Docs, Navisworks, BIM 360 Glue
  - Field, BIM 360 Plan
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.
Find Issues in BIM, Not On Site

Cost/Effect

Ability to impact cost
Cost of changes
The Cost of Information Loss

RFIs have a lot of overhead costs in addition to any delays incurred. The bigger the project the more RFIs. A large portion of rework is due to miscommunication and poor project data. Teams spend a lot of time on avoidable issues and searching for info.

$1,080 per RFI
20 RFIs per $1M
48% of rework
14 hrs / week

Sources:
Virtual Reality Review Meetings

AUTODESK® BIM 360™ + InsiteVR

https://www.youtube.com/watch?v=YsE0m6ZmTiU
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
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
Building Blocks for Success

- Single source of truth
- Easy collaborative VR
- Easy VR hardware
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.
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.
Make 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.
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
InsiteVR at AU

Forge DevCon
VR Zone

https://www.youtube.com/watch?v=_QxeEs0d7Rs
Thank you!

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Please fill out the speaker survey!