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CS21606

Scan and Layout: Autodesk Paris Office Retrofit with BIM 360 Solutions

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Learning Objectives

- Understand workflow from 3D scan to the field
- Learn how to take BIM to the field with BIM 360 Glue and BIM 360 Layout
- Learn how to value BIM 360 solutions to meet the construction needs
- Learn how to use reality-capture equipment

Description

What if we—Autodesk, Inc.—would use our own technologies for our own needs? In this class we will show you how we applied interesting workflows involving the following software: ReCap software, Revit software, BIM 360 Glue software, BIM 360 Layout software, and Point Layout to retrofit the Autodesk Paris office. After having generated a 3D model in Revit software based on point clouds reflecting existing conditions that we got from 3D scans, we made a retrofit proposal and used BIM 360 Layout software to stake out data into the field with a robotic total station. Finally, we used BIM 360 Layout capabilities to verify the as-built construction and update the model. This session features BIM 360 Layout, ReCap, and Revit. AIA Approved.

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Your AU Expert(s)

Olivier Bayle has over 19 years of experience in structural design, in a variety of fields ranging from simple construction schemes to highly technical engineering projects.
Prior to coming to Autodesk (Robobat company acquisition), Olivier worked as civil engineer in steel, concrete and timber design.
At Autodesk, Olivier has further engaged clients with BIM solutions, workflow integration and developing best practices in 3D visualizations, clash/collision detection and 5D construction simulations.
Currently, he is one of writer of Village BIM Blog.
Olivier holds a Graduate civil engineer from Clermont Ferrand – France

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Based in Autodesk, Inc.'s, Paris office in France, **Julien Drouet** is senior technical specialist in the EMEA (Europe, the Middle East, and Africa) Architecture, Engineering, and Construction (AEC) Team, focused on the construction and MEP (mechanical, electrical, and plumbing) portfolio.
Julien is an electrical engineer with 20 years' experience in the building, engineering, and construction industry. He has been involved in Autodesk's MEP product adoption for 9 years, and he's been in charge of the MEP Fabrication Solutions since Autodesk's first MEP fabrication product release.

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TypePad Village BIM Blog
Beyond Design Blog

OUTLINE

Example presentation

How to bring reality into virtual world

Collect points cloud with 3D scan

Create a consistent mockup on top points cloud

Reference points exported to the site

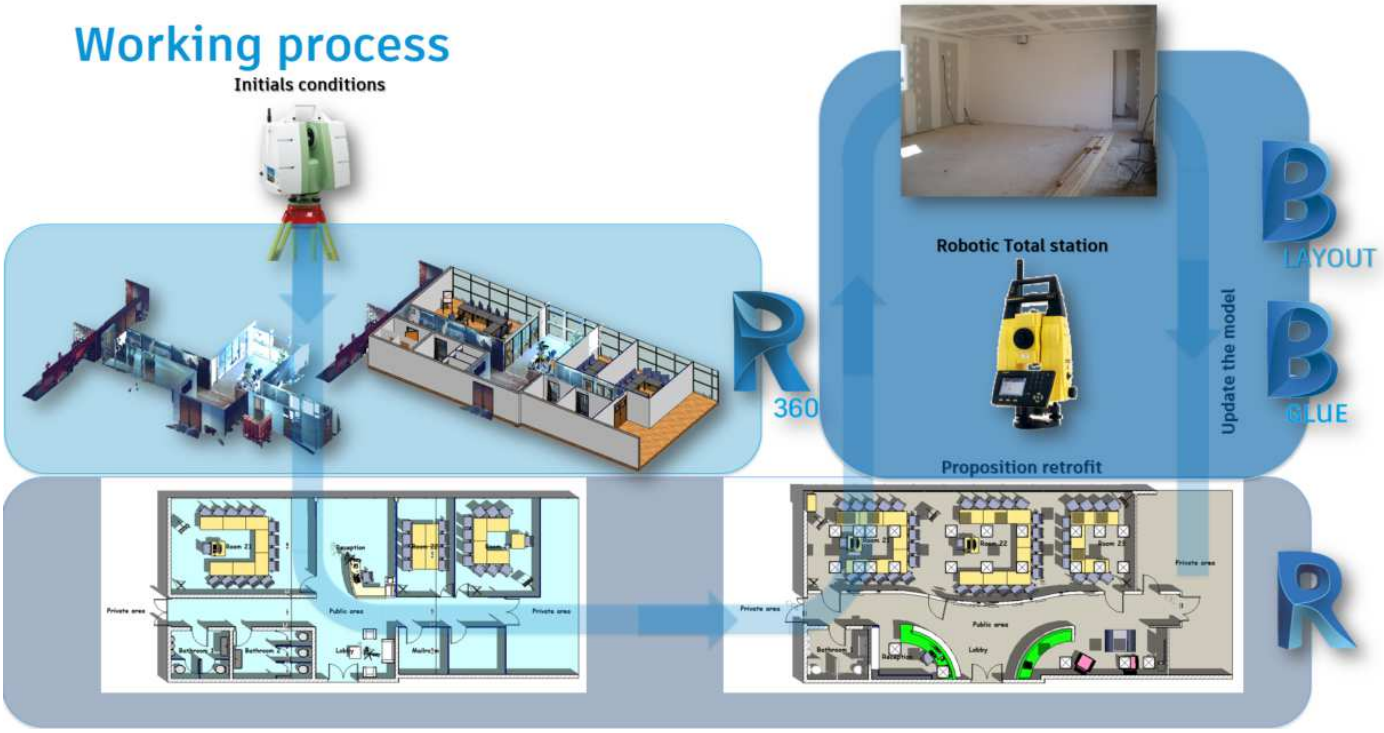
Compare as build points to the final mockup

Appendix

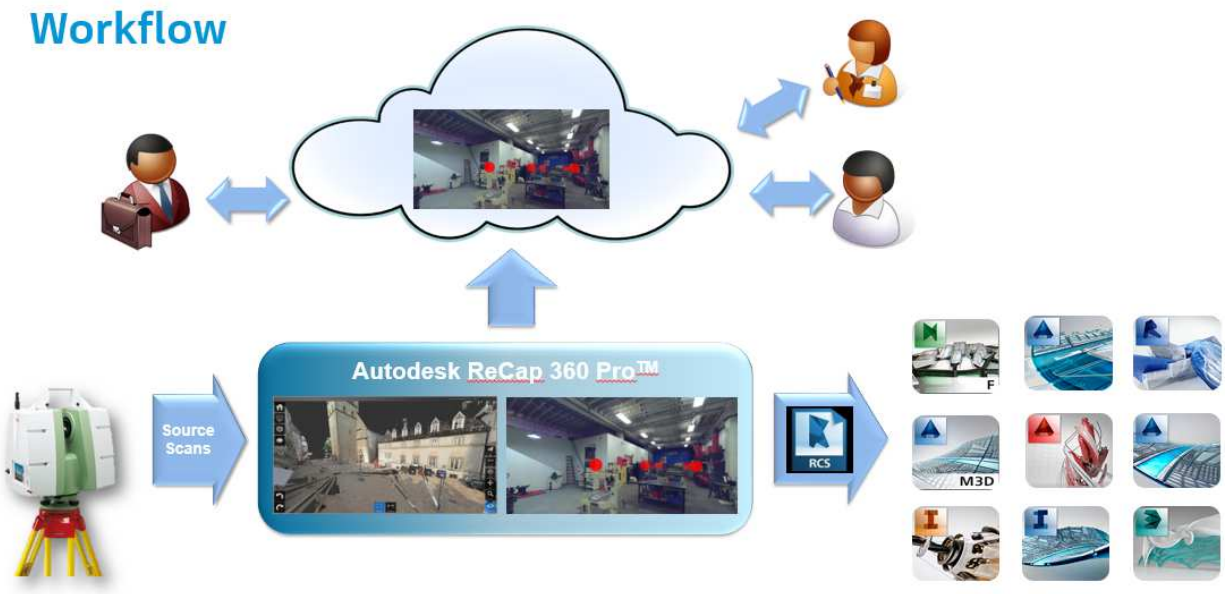
Example presentation:

We based our presentation on a real example. It was decided to retrofit Autodesk Paris Office reception.

1- The story started with a 3D scanner to catch existing conditions because we didn't have the original drawings. In our case, we used the 3D Scan called "P16" from Leica material.
2- Points clouds were collected, recorded and indexed in Autodesk ReCap 360 Pro software.
3- Into Autodesk Revit software, we built the mockup (initial conditions) on top of imported consolidated points cloud (format RSC).
4- Based on the mockup (initial conditions), some designs options were made and one of them was selected (final mockup).
5- From the final mockup some references points were added in the Revit model with Autodesk Point Layout plugin and uploaded into Autodesk BIM 360 Glue.
6- A total station (iCON builder 60 – Leica material) and Autodesk BIM 360 Layout were used to stake out references points on site.
7 – At the end of construction, we have compared as built points to the final mockup.



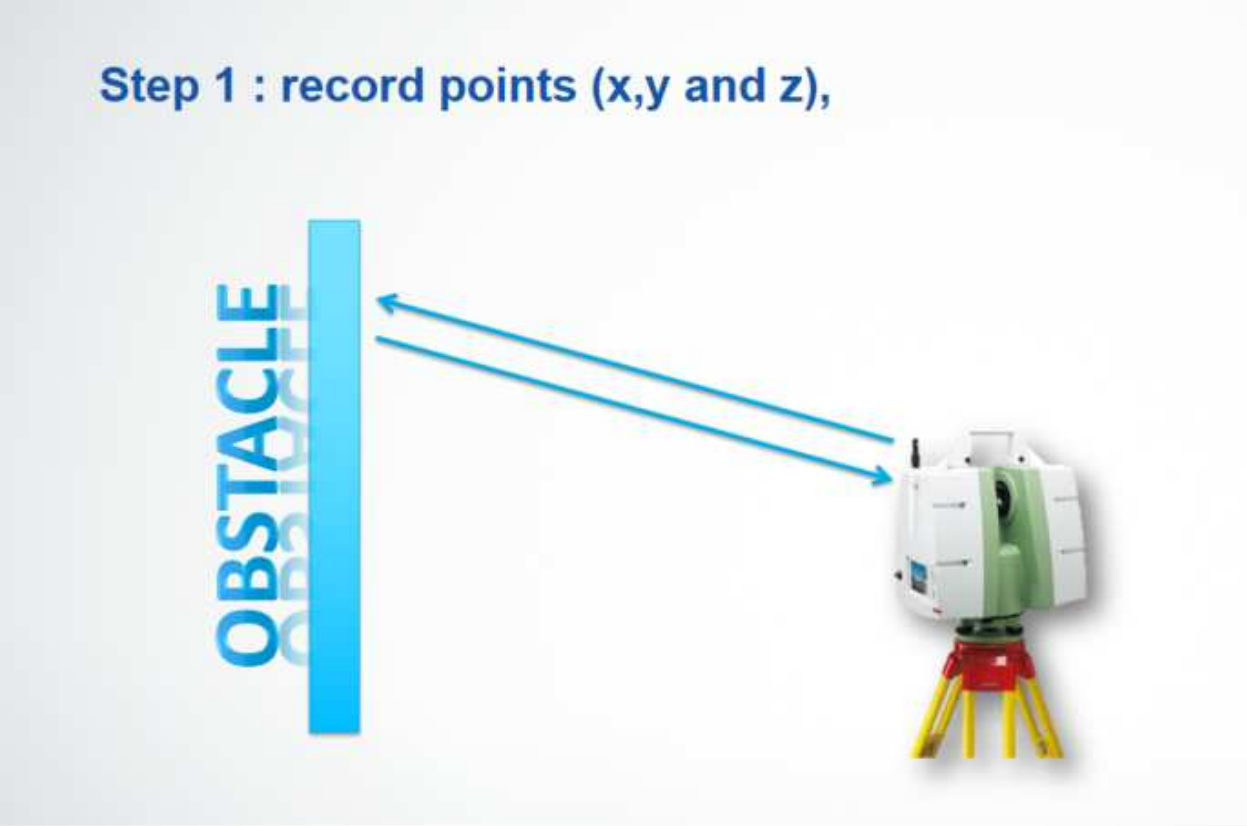
How to bring reality into virtual world :



Collect points cloud with 3D scan :

This video illustrates how to use Leica 3D scan :
Using the 3D scan screen, you can set up a project name and some parameters (resolution, colors, …).
There are two steps:

- Step 1 : the 3D scan emits a laser. When it touches an obstacle, the data (distance and angle) are recorded. This operation is made horizontally and vertically to generate a points sphere.
- Step 2 : the 3D scan takes pictures (color or black and white).

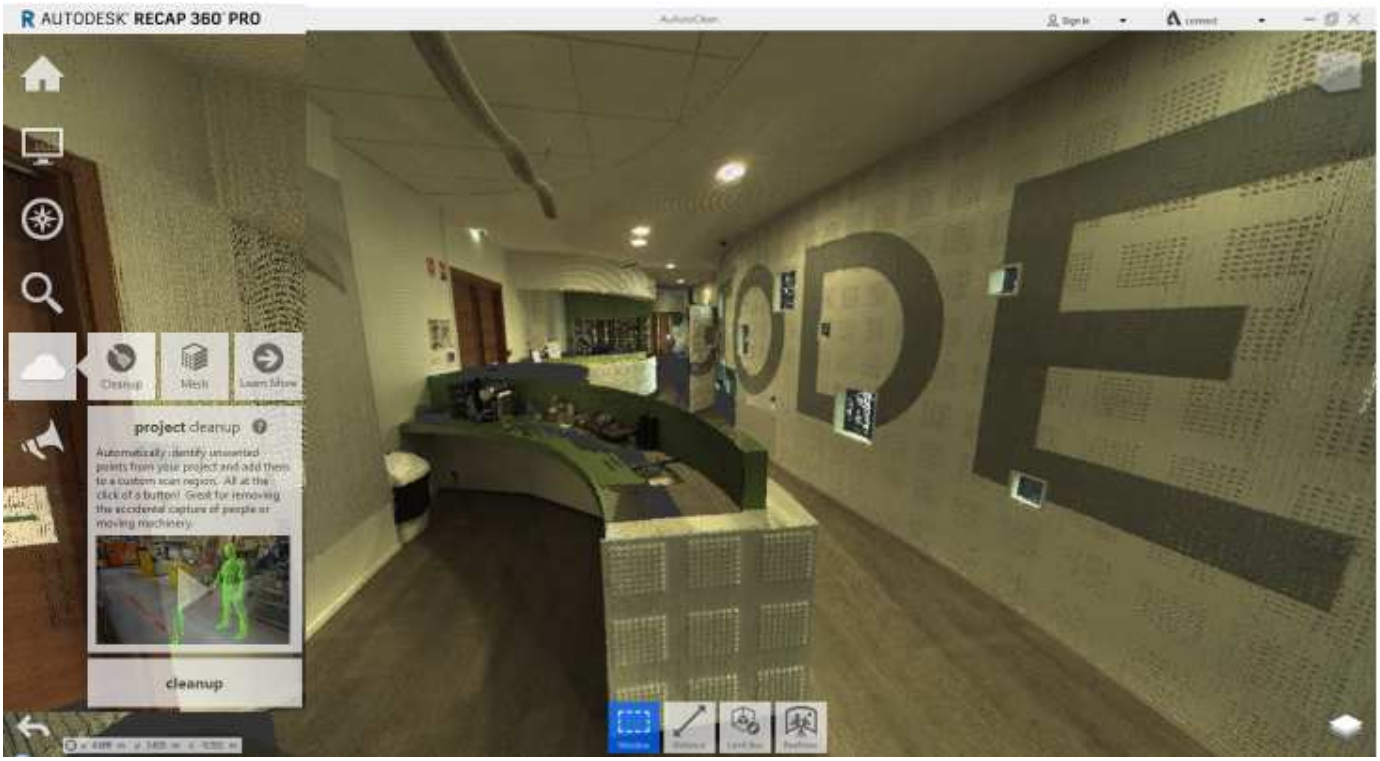


Using Autodesk ReCap 360 Pro software, you can :

- Import,
- Record (merge),
- Index

To obtain a consolidated points cloud.

Note : you can use the Automatic cleanup tool to optimize your points cloud.

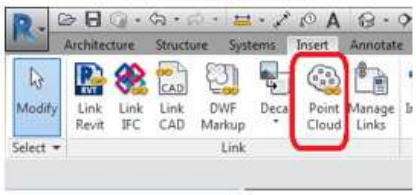


Create a consistent mockup on top of points cloud:

Using Autodesk Revit software, in the “Insert” tab, you can import the points cloud easily.

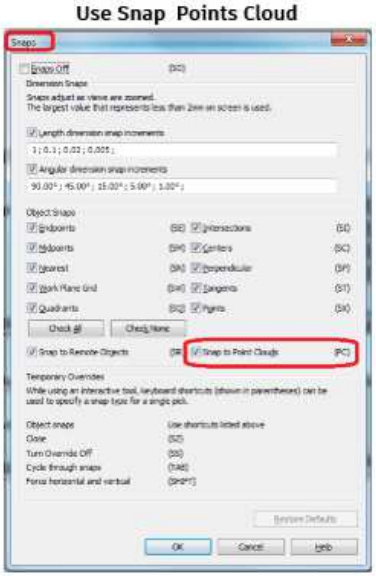
Setup: Points cloud integration into Revit

Insert Points Cloud

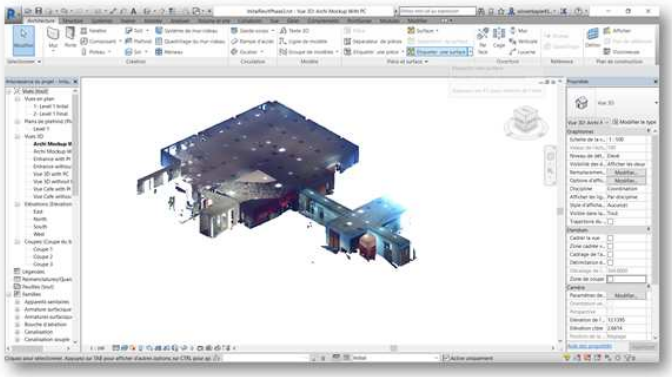


Use View range

Use Snap Points Cloud



Final result : Points cloud integration into Revit



Points cloud only

Mockup + Points cloud

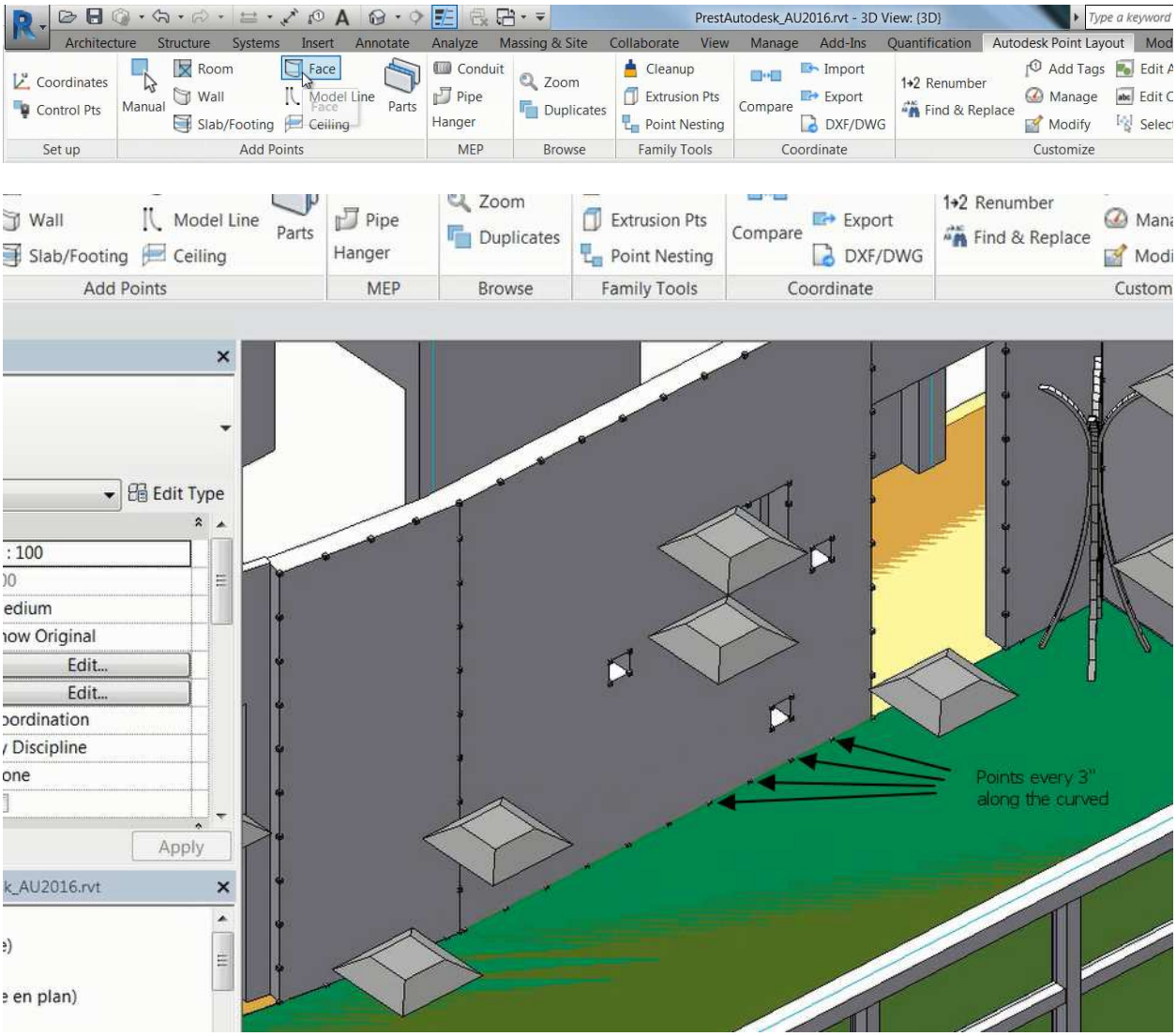
Mockup only

Ajouter des captures d’écran du travail de design, avec l’avant/après et le choix d’option retenu

05/06/2014

Reference points added in the model to be staked out on the site :

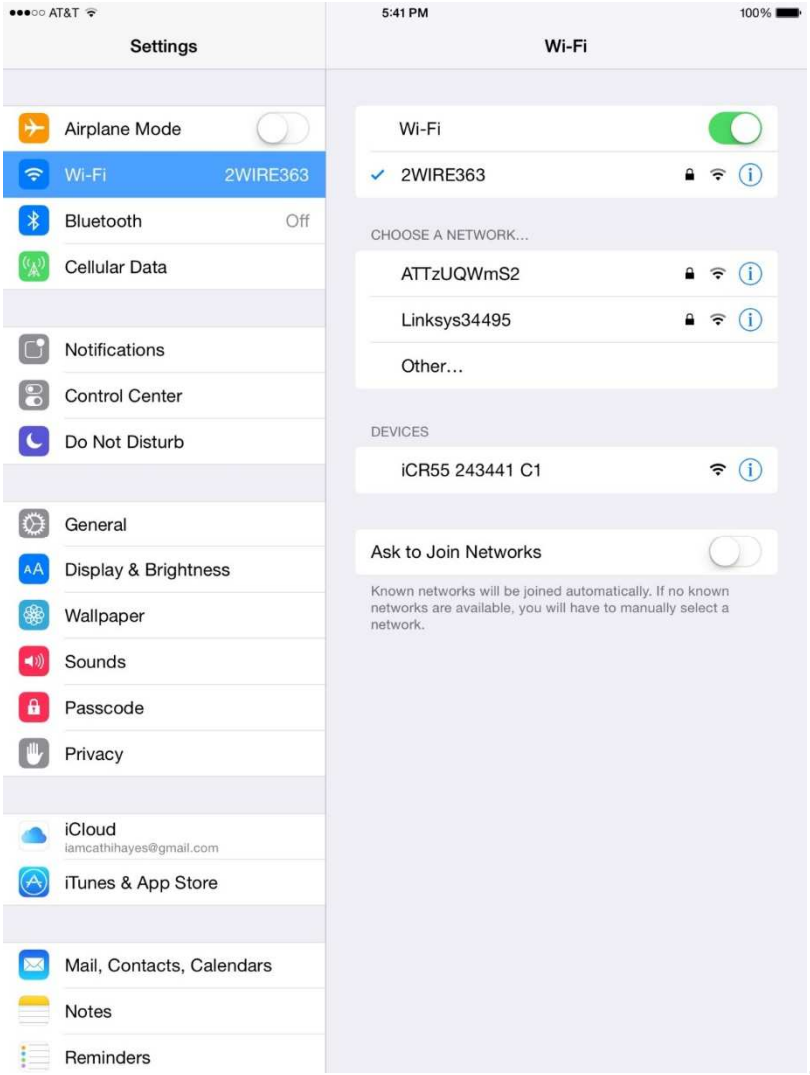
In Revit, we will use Autodesk Point Layout to add points in the model, points that will be used on the construction site to help Layout for dedicated éléments.
In our example, we added points on the bottom of the curved wall. Autodesk point Layout provide tools to add points manually or automatically to elements, faces, slabs…with specific settings such as position of points (centerline, edges…) or distance between points.



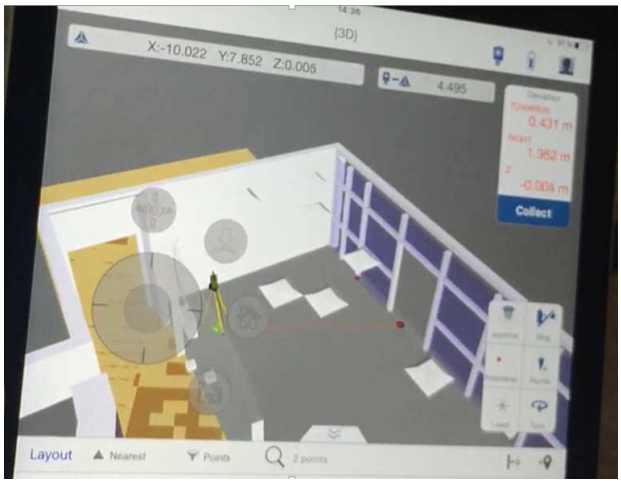
Once points are added in the model, we uploaded it on BIM 360 Glue in a project declared as a BIM 360 Layout project as well.
Now I am able to go on the construction site with the Model, and layout points in.

On the construction site, I can run the BIM 360 Layout app on the iPad and open the project.

The first step will be to connect the iPad with the Leica iCON robot 60, through Wifi (possible through Bluetooth)



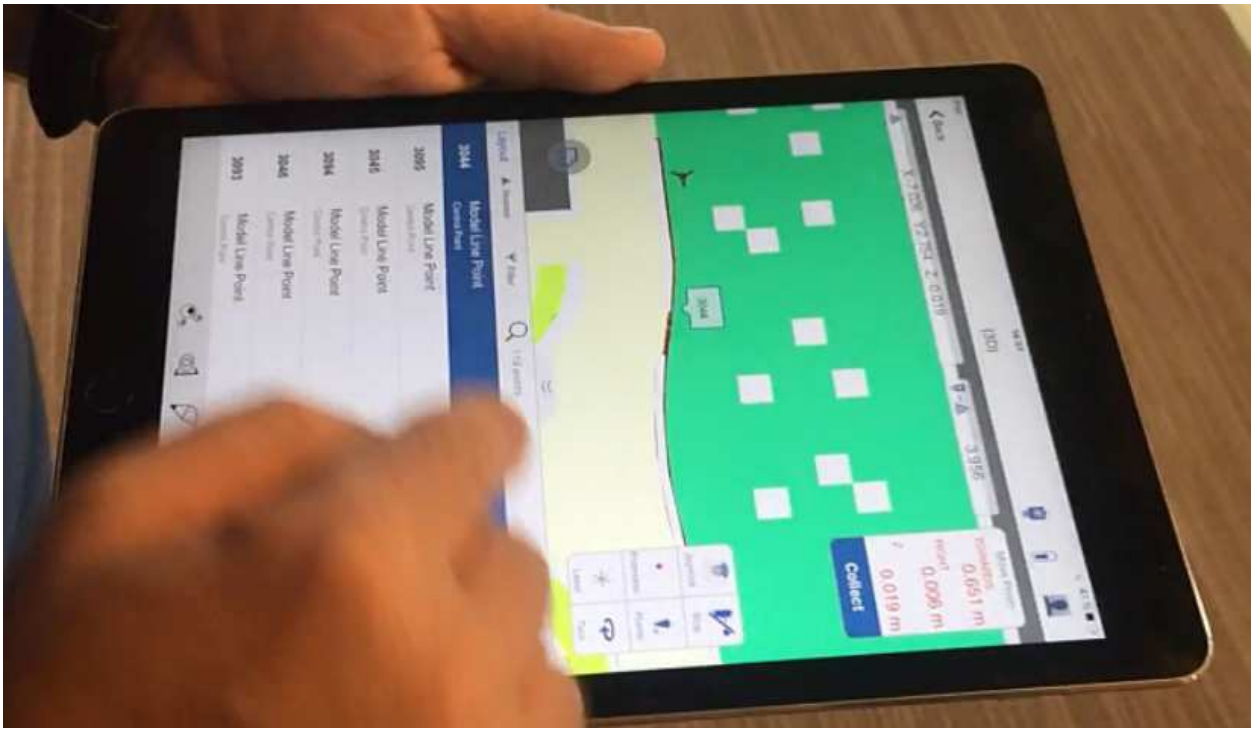
Then I need to localize the robot in the model. To do so, I will use at least 2 control points, points in the model that exists already on the construction site and that I am able to point out with the laser (prismless mode)



We are now ready to stake out points for our curved wall.

2 methods are possible.
First is using the prism. The robot follows the prism and indicate to the iPad app what is the distances (x, y, z) between the stake out point in the model, and the prism. On the iPad, the prism display as a red circle. Move to the point, closer and closer. When the prism is exactly where the point has been put in the model, the circle turns to green. You can mark the point position on the ground.

Second is to use the prismless mode. In that case, on the ipad you select the point to layout. The laser will point out the point to be staked directly on the ground.
It is easier, but depending on the angle between the robot laser and the ground, it could be not so accurate, compared with the previous method.

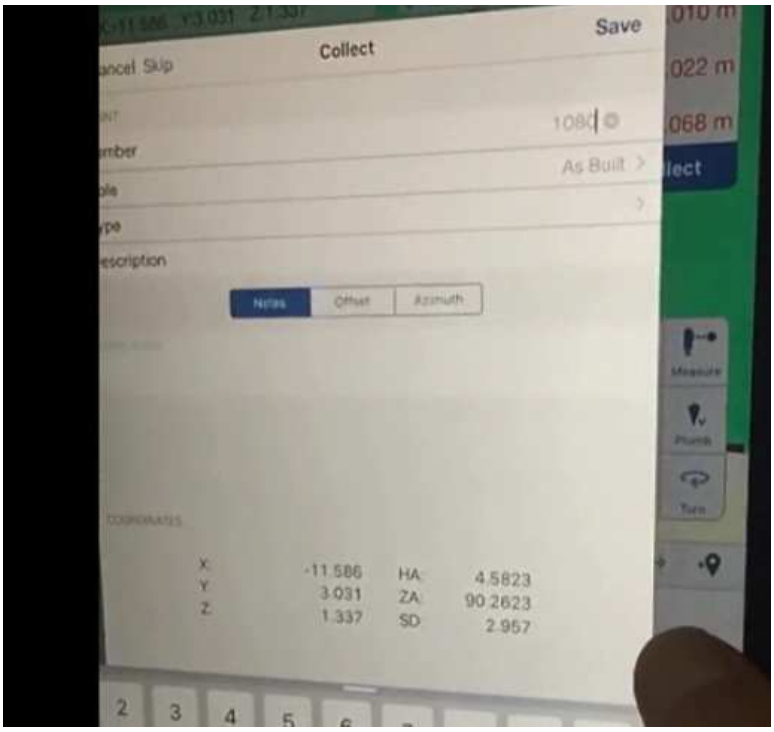


Compare as build points to the final model :

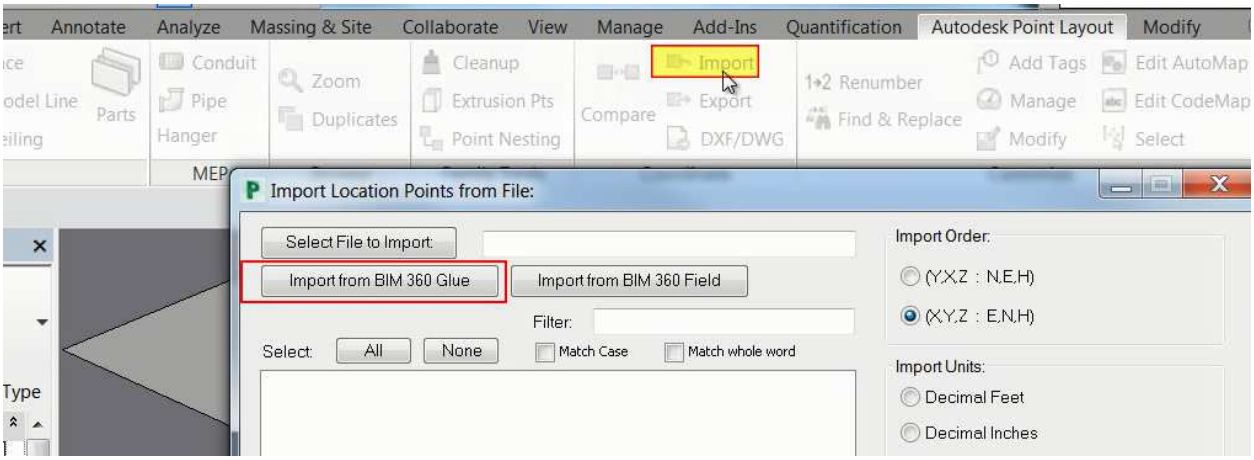
Now the project has been built, we would like to check the quality of the work done, and the model accuracy, as an as-Built model.

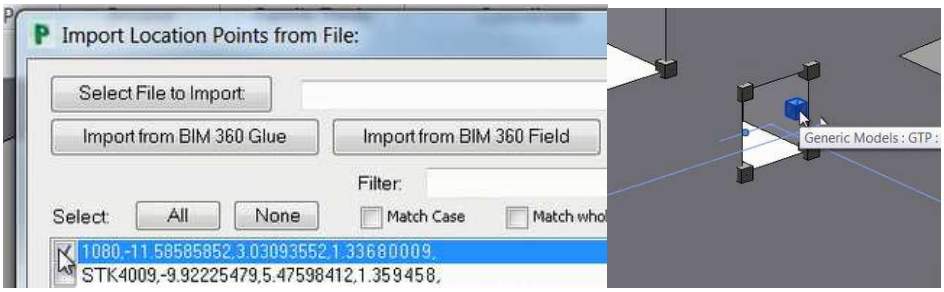
With the Leica iCON robot, we will collect points on the construction site.
Using Prismless mode, we select an existing point on the iPad app and ask the robot to target this point. In our example, we select the point on the upper right corner of a small window and look what the laser Robot is pointing out

Clearly, a shift is existing between the model and the Real Life. The model has to be updated. Then we move the laser to the right position, and collect the point as an as-built point :

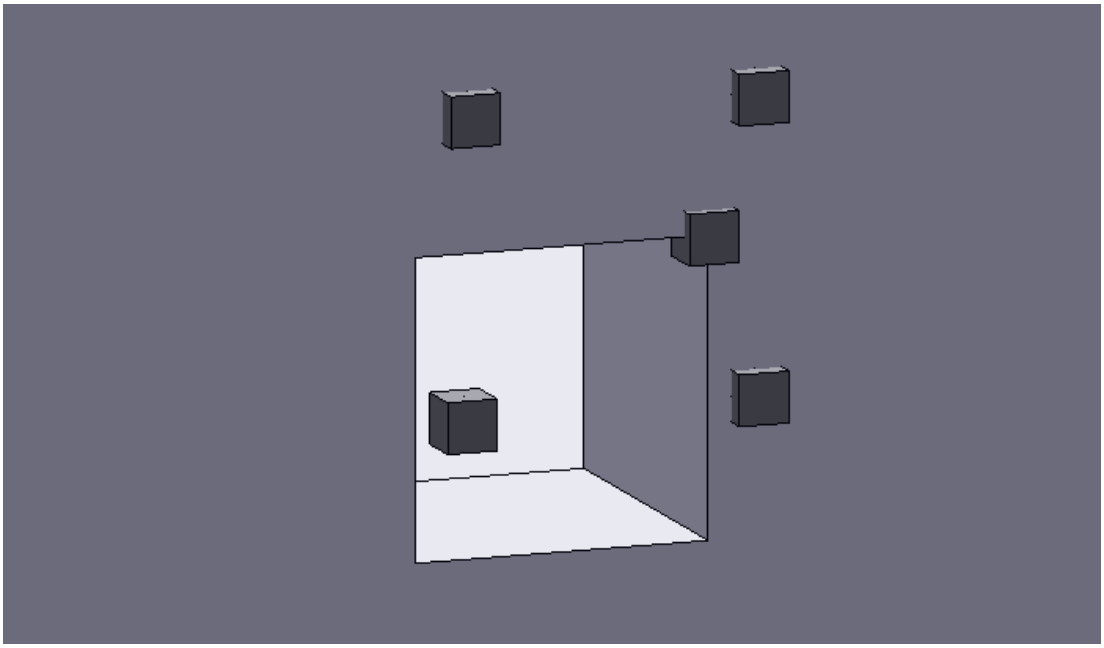


Once points are collected, they are save in the model. So they are available in BIM 360 Glue. To put this collected points in Revit, and update the model, we will use Autodesk Point Layout and import from BIM 360 Glue:





Final step will be to update the model, based on collected as-built point.



Appendix

Used software

To perform the whole process, several software are used:

- Autodesk ReCap Pro 2017 :
  Used to register, index and clean all points clouds into one single points cloud.
  More info on : http://www.autodesk.com/products/recap-360/overview

- Autodesk Revit 2017:
  Used for the design of the full steel structure.
  More info on : http://www.autodesk.com/products/revit-family/overview

- Autodesk Remake 2017 :
  Used to scale, edit, fix and decimate meshes.
  More info on: https://remake.autodesk.com/about

- Autodesk Stingray 2017 :
  Create Immersive visit with real rendering.
  More info on: http://www.autodesk.com/products/stingray/overview

- Autodesk BIM 360 Glue :
  Manage and collaborate BIM mockup in the cloud platform.
  More info on: http://www.autodesk.com/products/bim-360-glue/overview

- Autodesk BIM 360 Layout :
  Connect coordinated model to the field.
  More info on: http://bim360.com/bim-360-layout