From point cloud to BIM

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Who is kubit?

- Germany based software developer
- Headquarter in Dresden, Partner office in USA
- Started 1999, today 25 people
- A complete "**From Real World to CAD**" portfolio with software for laser scanning, photogrammetry and total stations
- ~ 2.300 customers with ~ 5.500 licenses worldwide

AutoCAD based products

Generic products

PointSense
basic / Pro

Industry-specific products

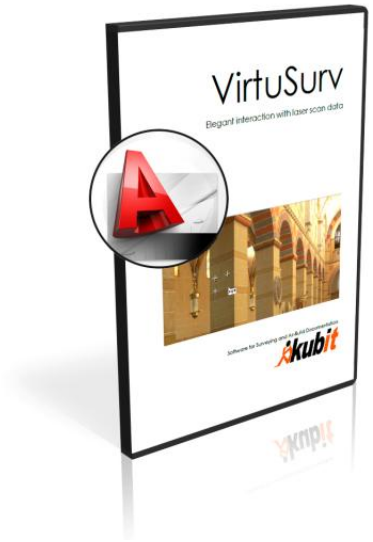
PointSense
Building

PointSense
Heritage

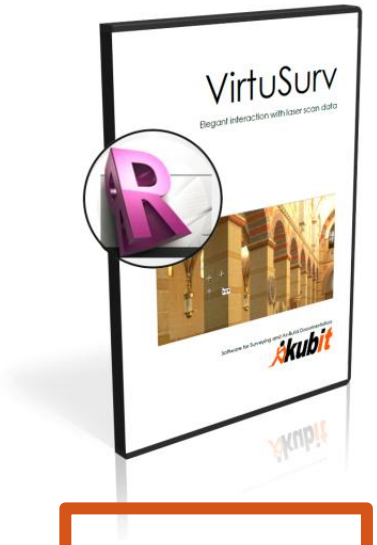
PointSense
Plant

Stand alone product

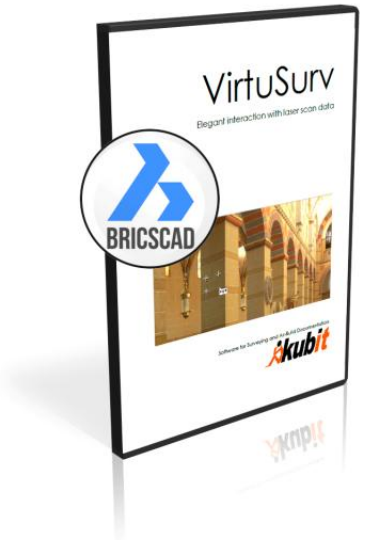
CAD-specific connectors



VirtuSurv
with
AutoCAD (LT) Link



VirtuSurv
with
Revit Link



VirtuSurv
with
BricsCAD Link

VirtuSurv
with
generic
Windows Link

Laserscanning and BIM

- Point clouds are perfect for as-built condition surveying. But they are not intelligent in itself. „Simple“ XYZ measurements.
  - → **Intelligent, parameterised, CAD objects wanted for planning**
  - → **BIM: Plan, Design, Construct, Operate (Cost, Bill of quantities, etc.)**
  - → **BIM works with (intelligent) object classes and families**
  - → **4D (time), 5D (cost)**

- Laserscanning shadow causes incomplete object coverage
  - → **Complete models needed, e.g. visualisation, clash detection**

- Point clouds are not water-tight
  - → **3D meshing or printing require „water-tight“ models**

Laserscanning and BIM

- Point cloud data consumes large amounts of data
  → **Reduction of data and simple exchange of BIM models**

- A point cloud is not a BIM model
  → **BIM needs one model basis for BIM process (Planning, Design, Construction, Mangement)**

  → **Conversion from point cloud to BIM required!**

BIM becomes standard

"The adoption of the directive, officially called the European Union Public Procurement Directive (EUPPD) means that all the 28 European Member States may encourage, specify or **mandate the use of BIM for publicly funded construction and building projects in the European Union by 2016.** The UK, Netherlands, Denmark, Finland and Norway already require the use of BIM for publicly funded building projects."

Source: http://inthefold.autodesk.com/in_the_fold/2014/01/european-parliament-directive-to-spur-bim-adoption-in-28-eu-countries.html

Laser Scanning Process

On Site

Capturing

Scans from different positions

In the Office

Registration

Combine the individual scan positions into one common reference system

Pre Process

Clean and filter the raw Scan data

Pre-Processing Tool

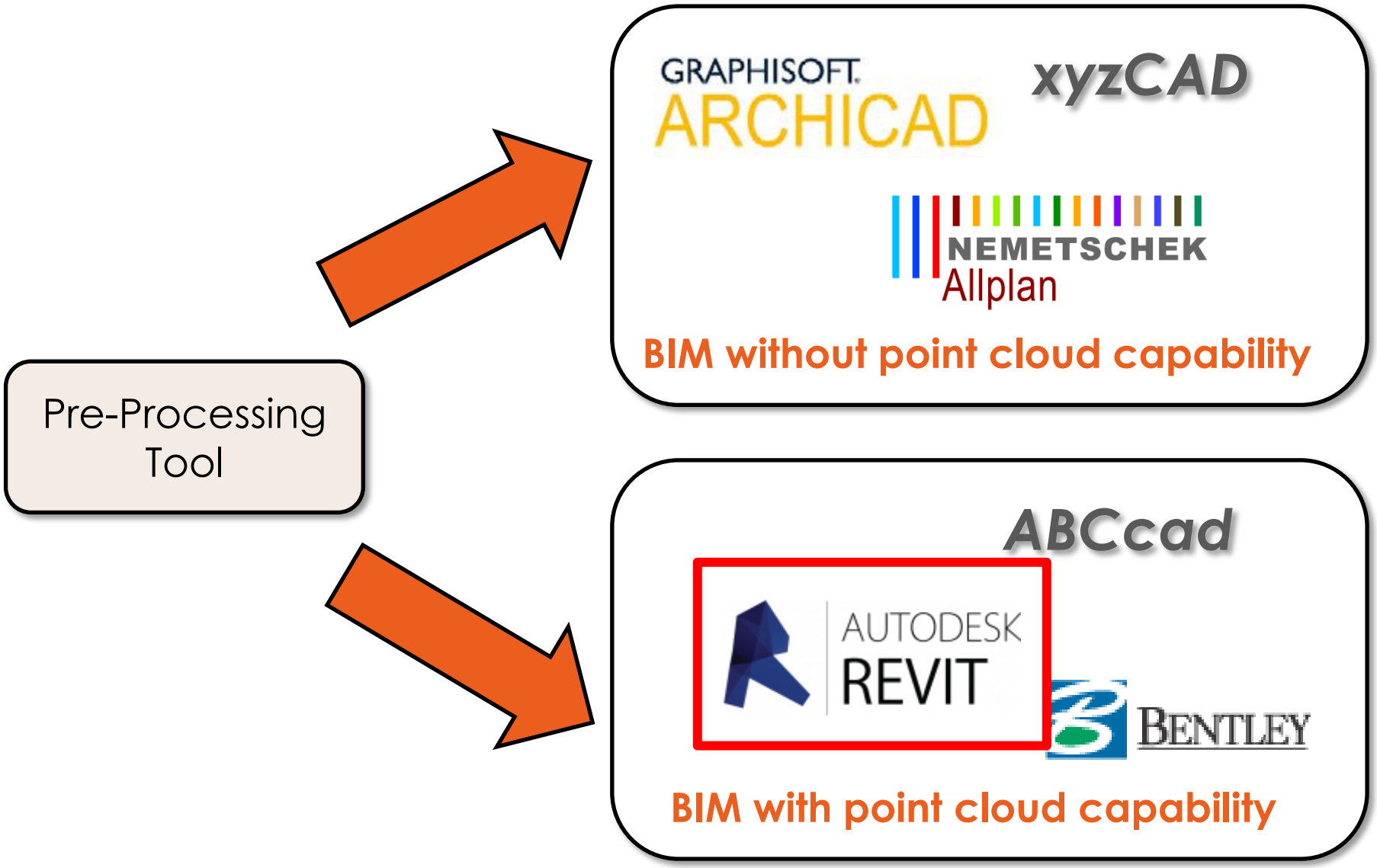
Post Process

Interpretation

and modeling

Design Tool

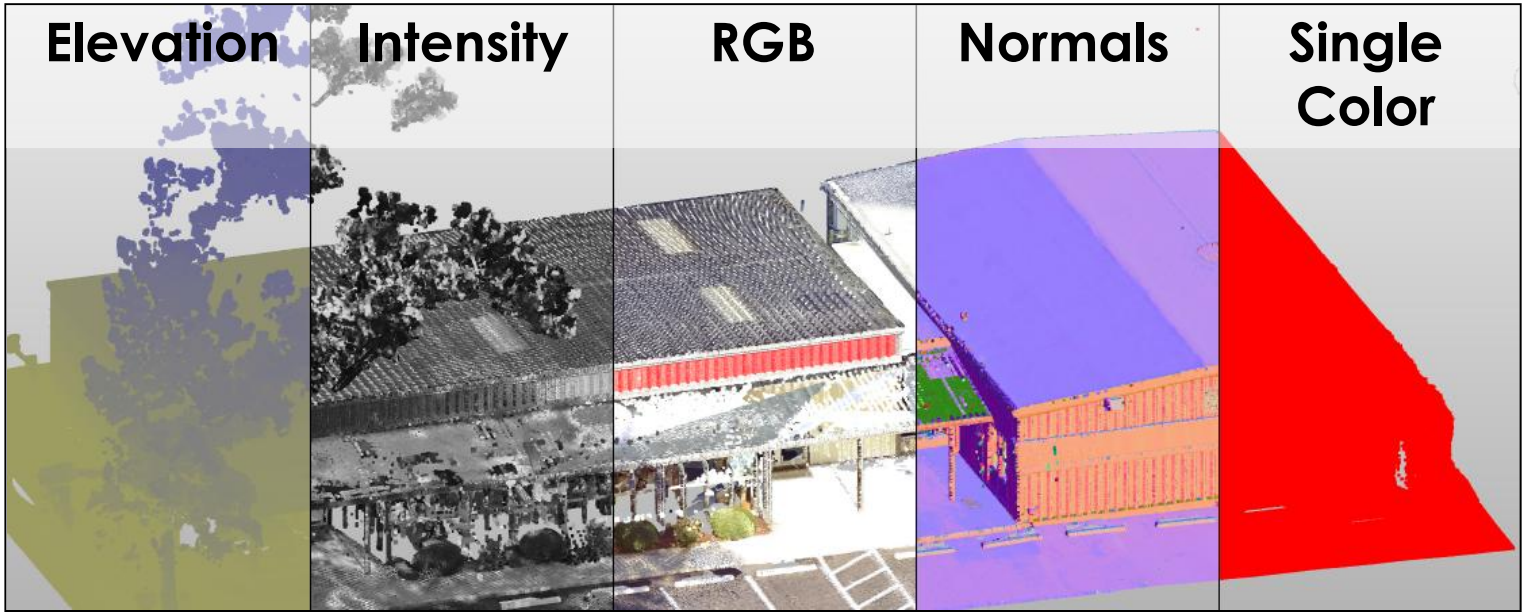
Two different initial situations



What can Revit do with point clouds?

Visibility

- View dependent control
- Choose between different color options
- Hide point cloud or only different scans
  (if you use a rcp project with scan positions!)



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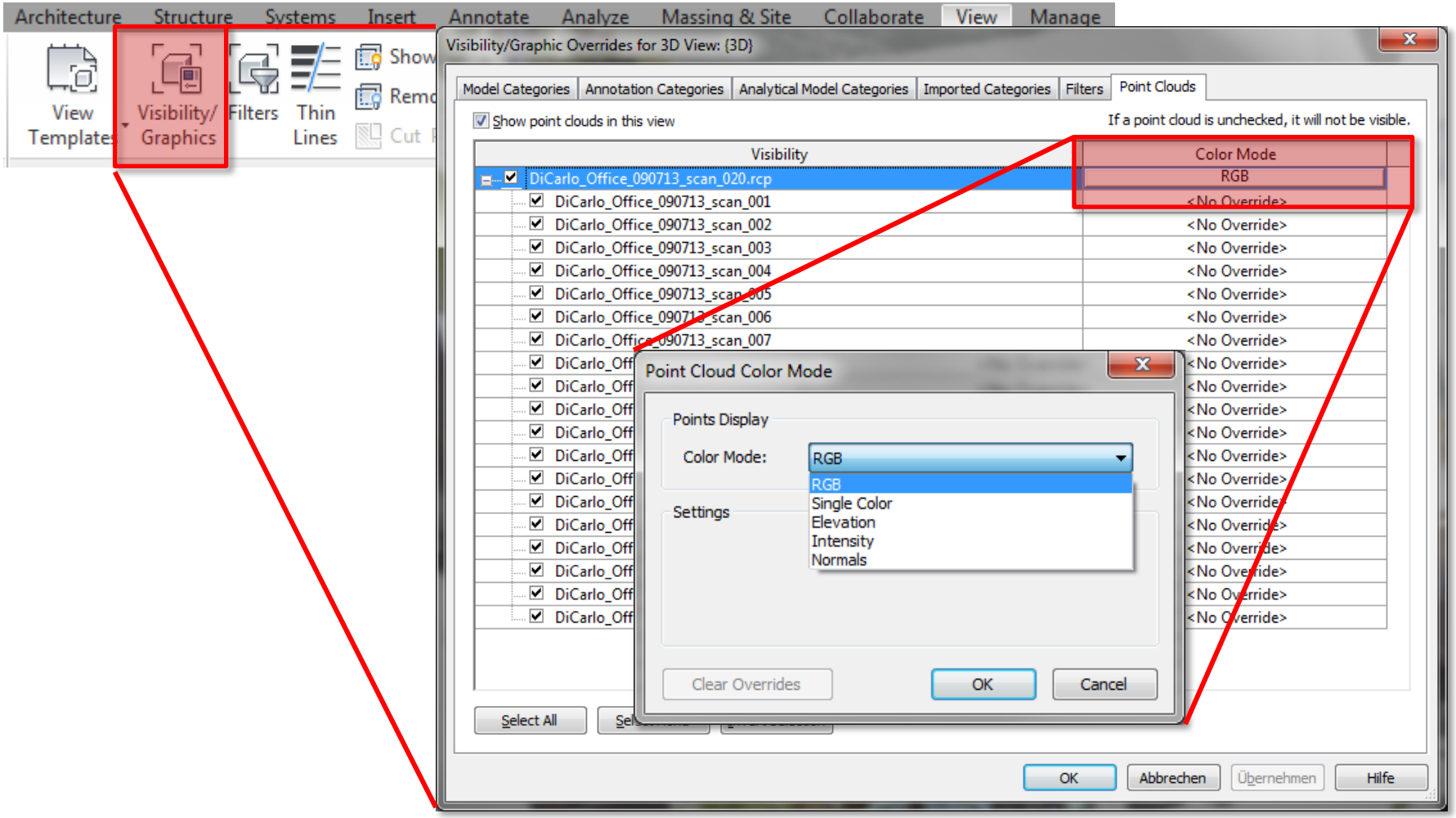
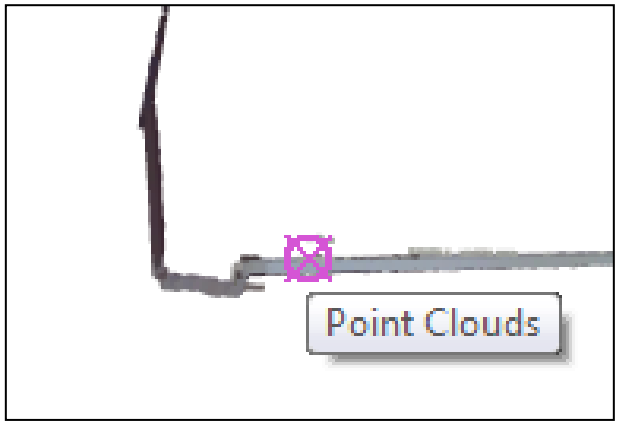


What can Revit do with point clouds?

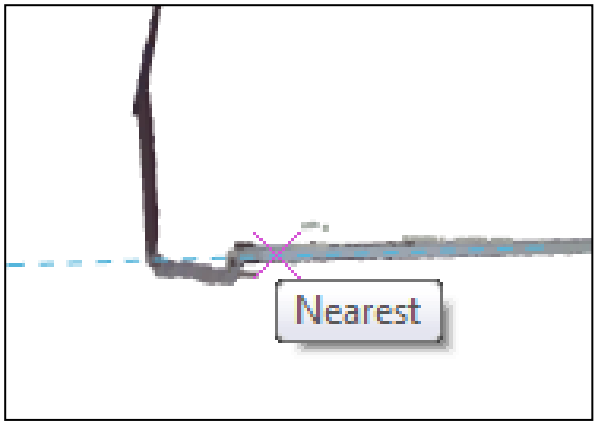
Behavior

- Like any other model object
  → Select, Move, Rotate, Mirror (if you have a good reason for that!)
- Point cloud snapping

Point Snap



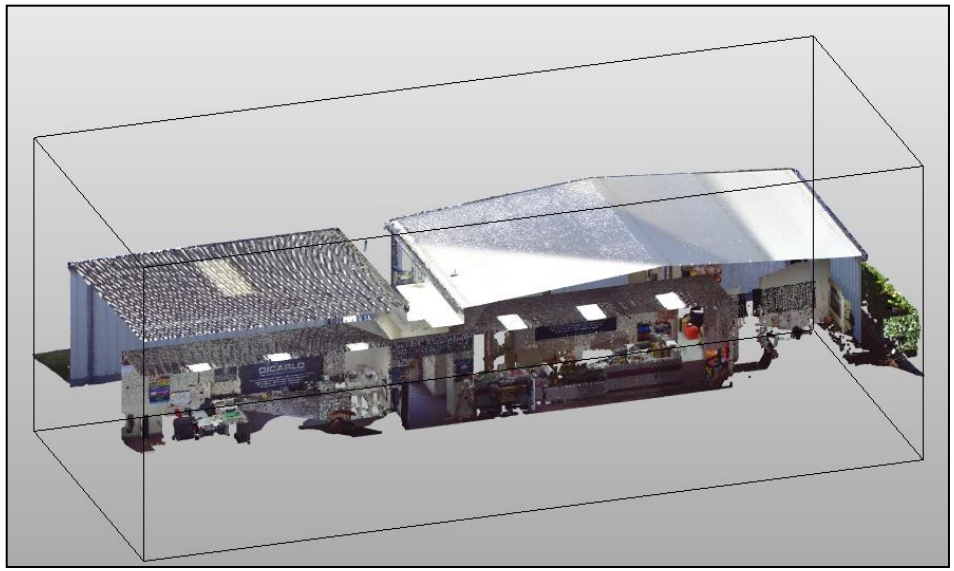
Planar Snap

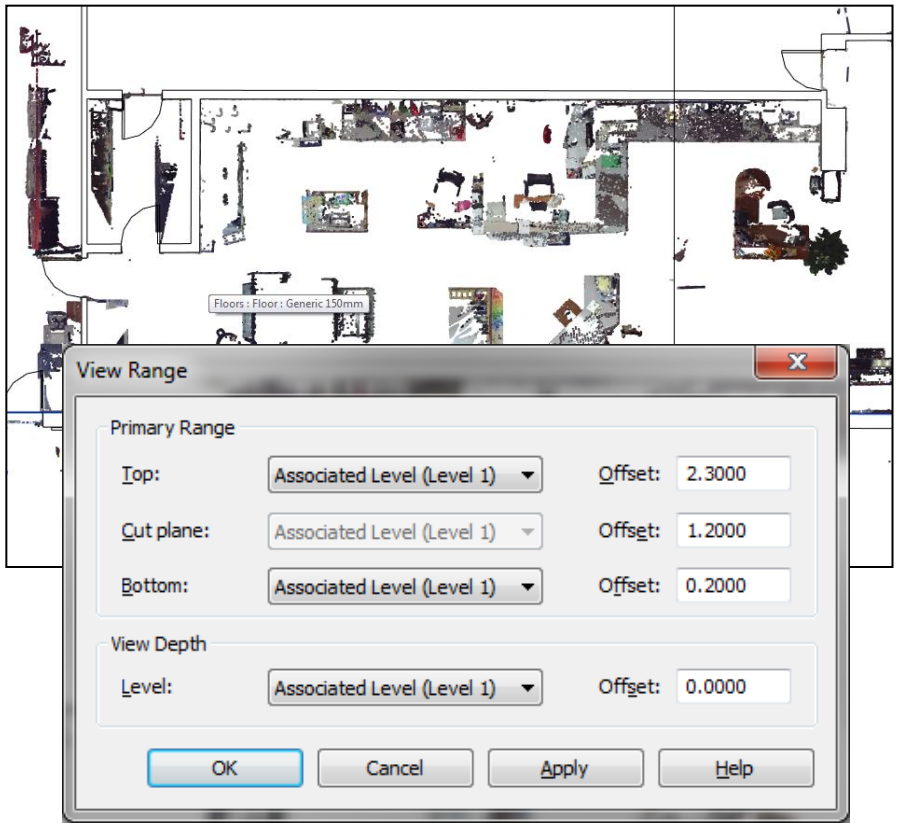


What can Revit do with point clouds?

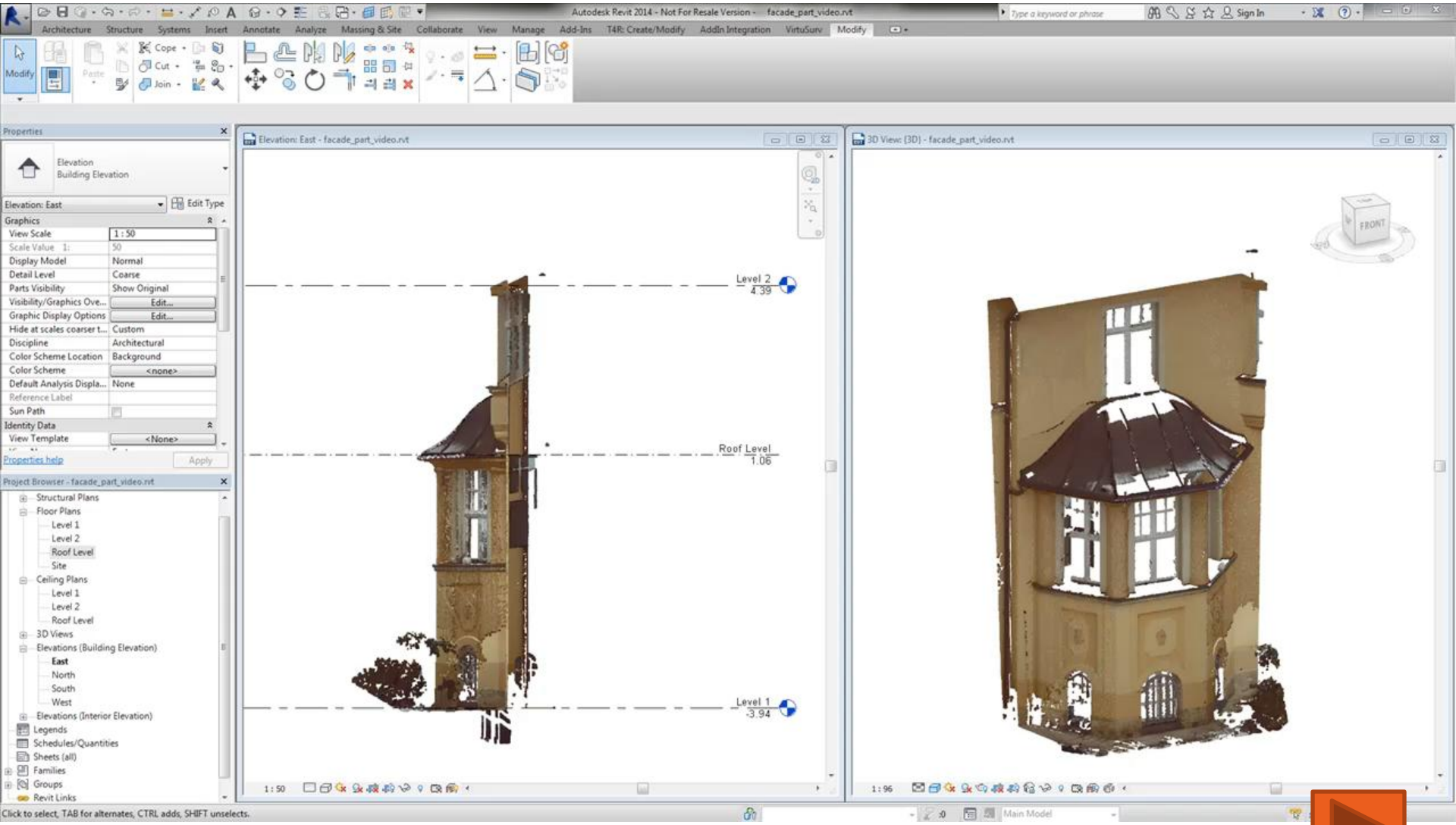
Behavior

- Clipped by section boxes and view ranges like any other model object





Example: Modelling a Roof with In-Place Mass



What can Revit NOT do with point clouds?

- No real 3d point snapping
  → Snapping works only in the active work plane

- No scan view available
  → Often more intuitive and easier navigation

- No point cloud support in the family environment
  → Necessary to create individual building components

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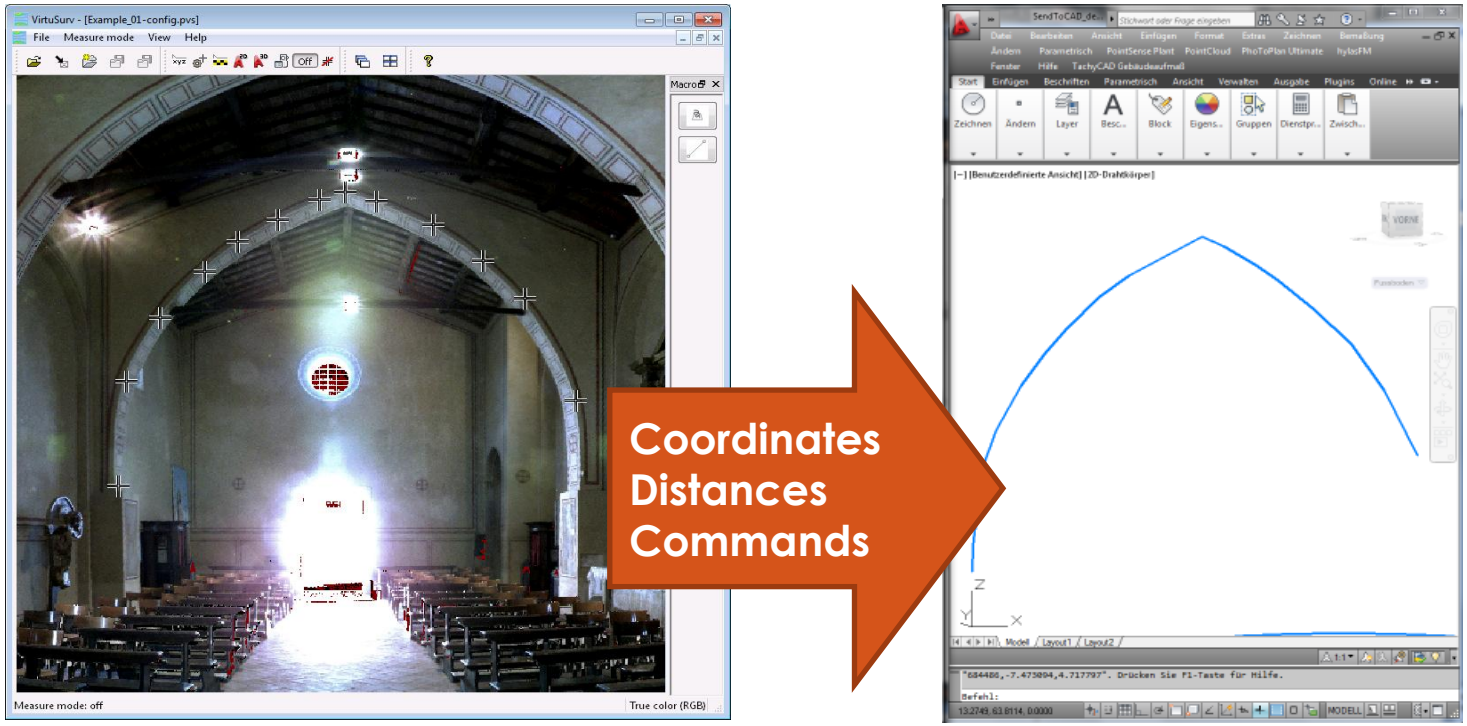
kubit VirtuSurv

VirtuSurv CAD Link

Create CAD drawings

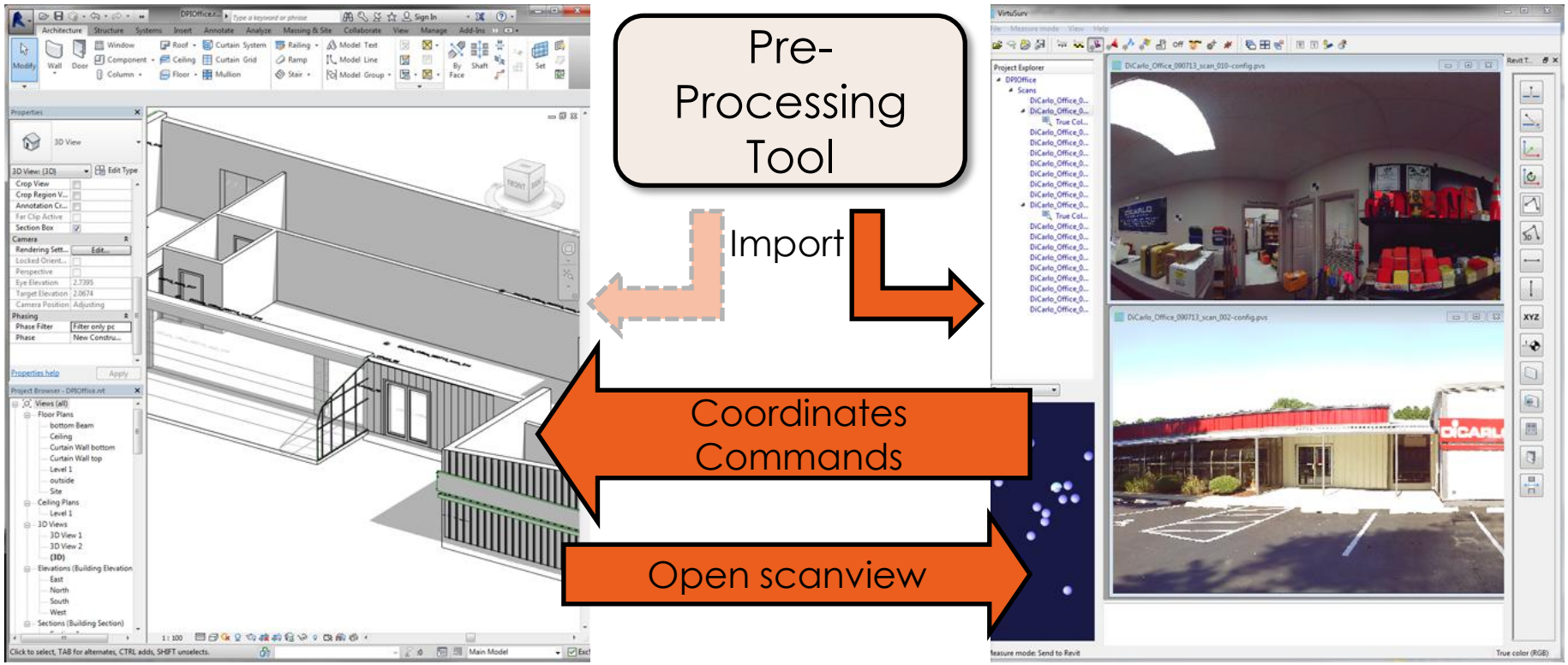
- Send coordinates, distances, (commands) to **any CAD system**.
- By measuring and clicking in the scan the geometry is drawn.



Scan view

- VirtuSurv extends Revit with panorama scan views

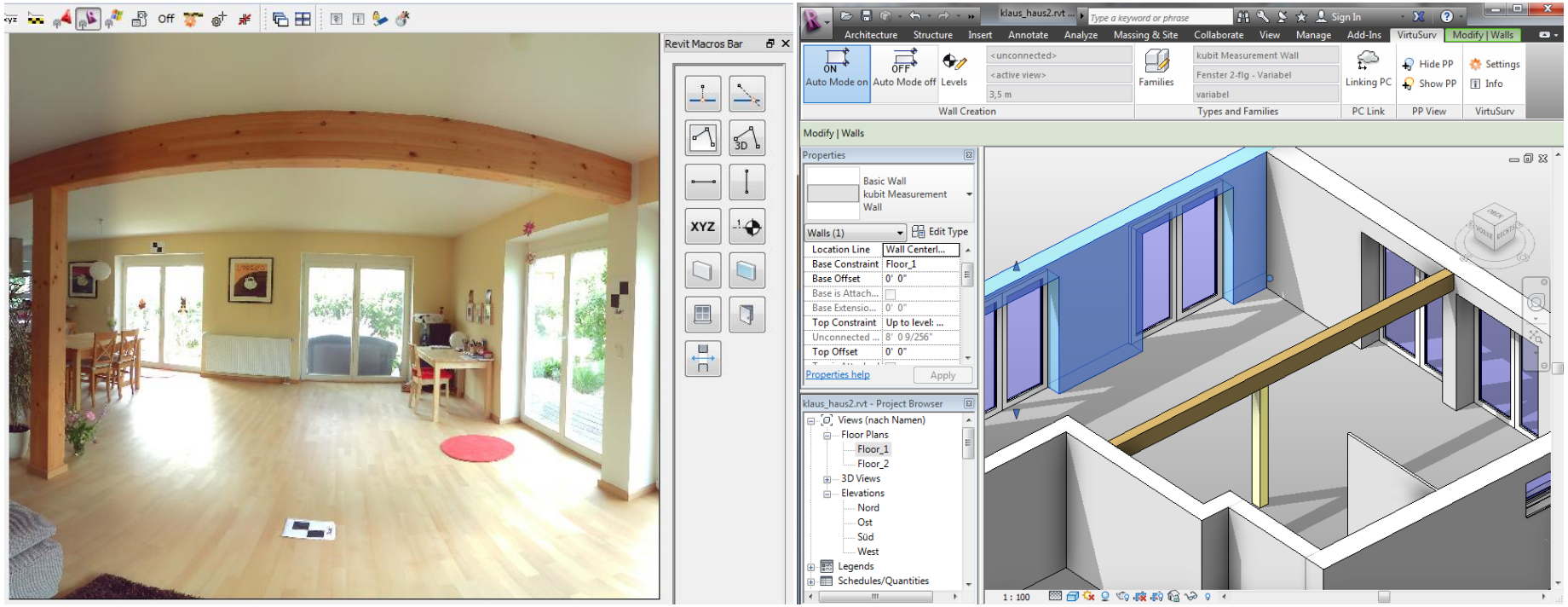
  → Create BIM elements (walls, windows …) or generic elements (lines, points …) inside the photo like Scan View



VirtuSurv Revit Link

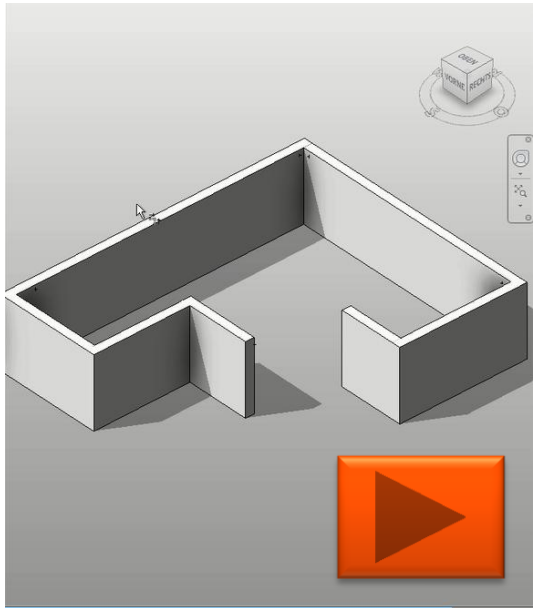
BIM modeling with the Revit link of VirtuSurv for generating

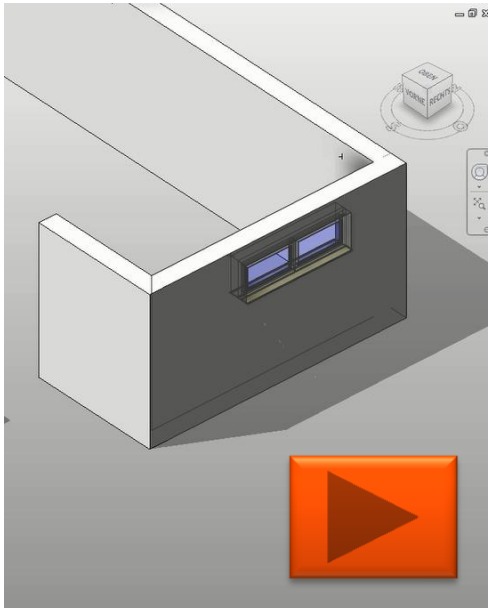
- architectural BIM elements
- 3D construction helpers
- directly **inside Revit**



Creating BIM elements

- Fast generating of levels, walls, doors, windows and openings
- Most elements by just 2 clicks



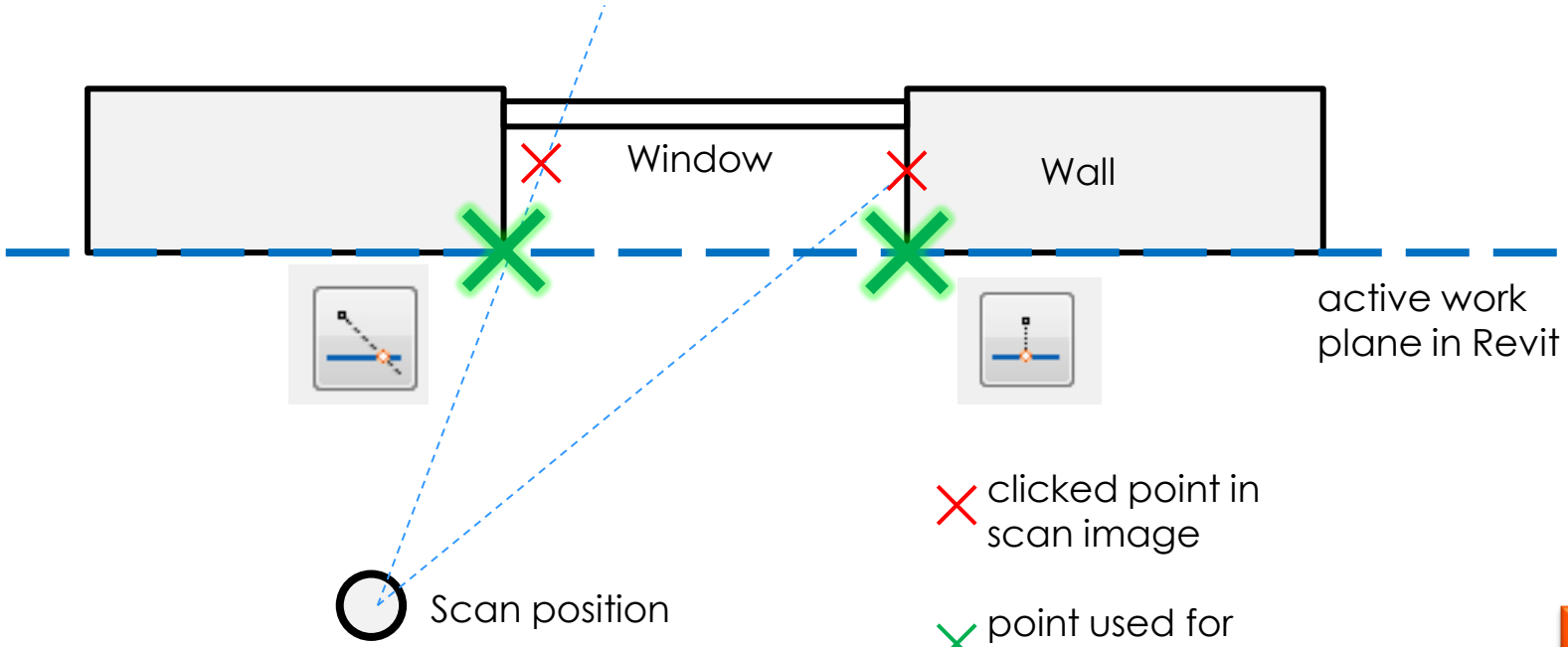


Point Modes for accurate element construction

Point perpendicular to active work plane

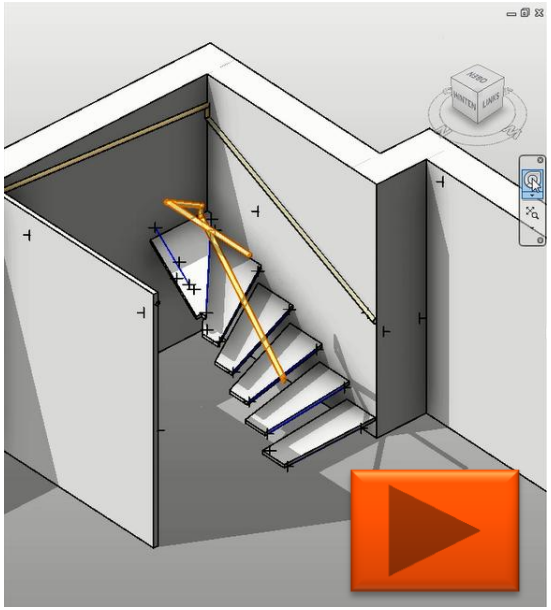
Intersection Point

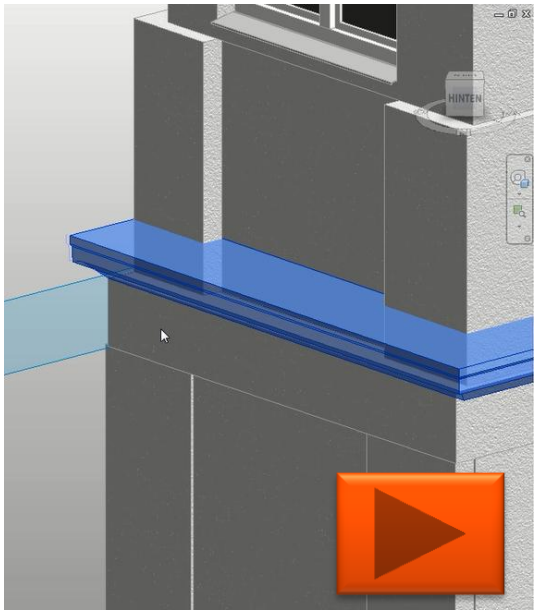
- Usable with nearly all VirtuSurv for Revit commands



2D and 3D Construction helpers

- Use 2D detail lines, 3D model lines or 3D construction points to generate other shapes

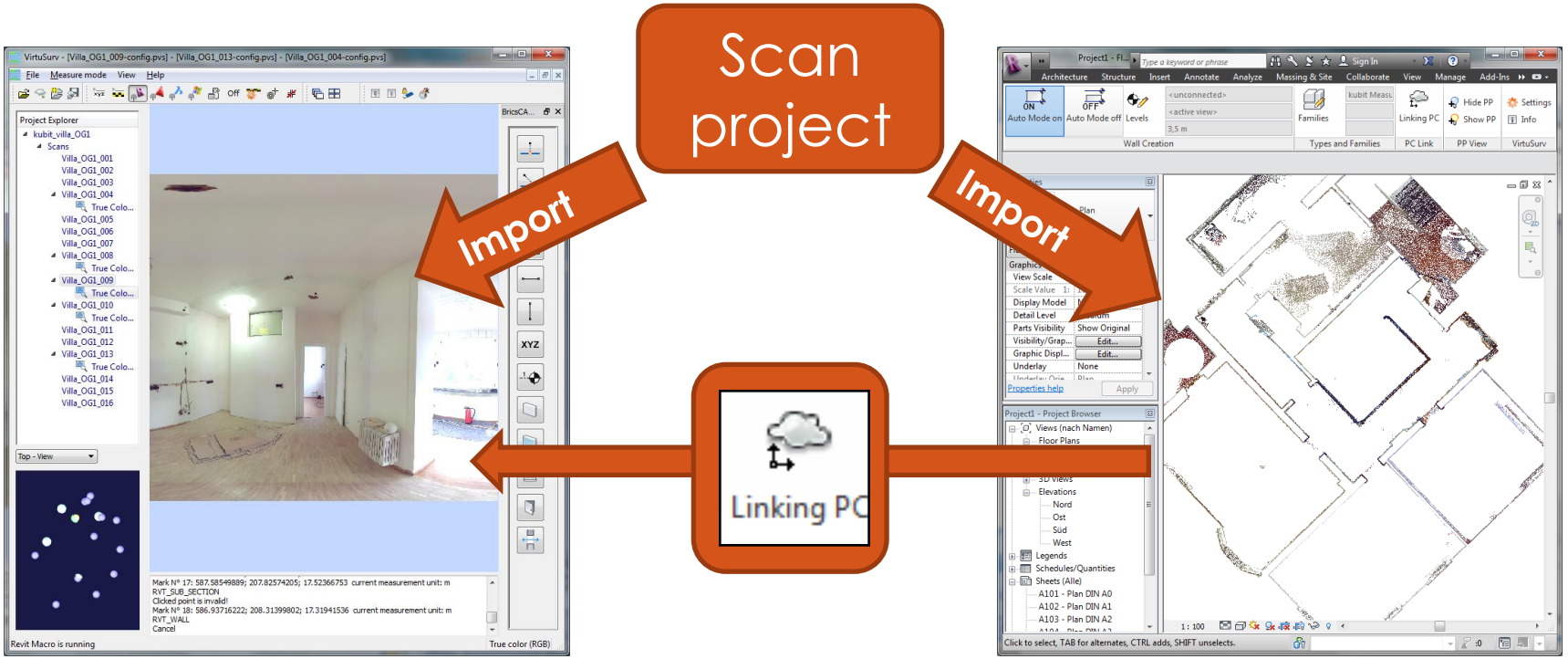




VirtuSurv Revit Link

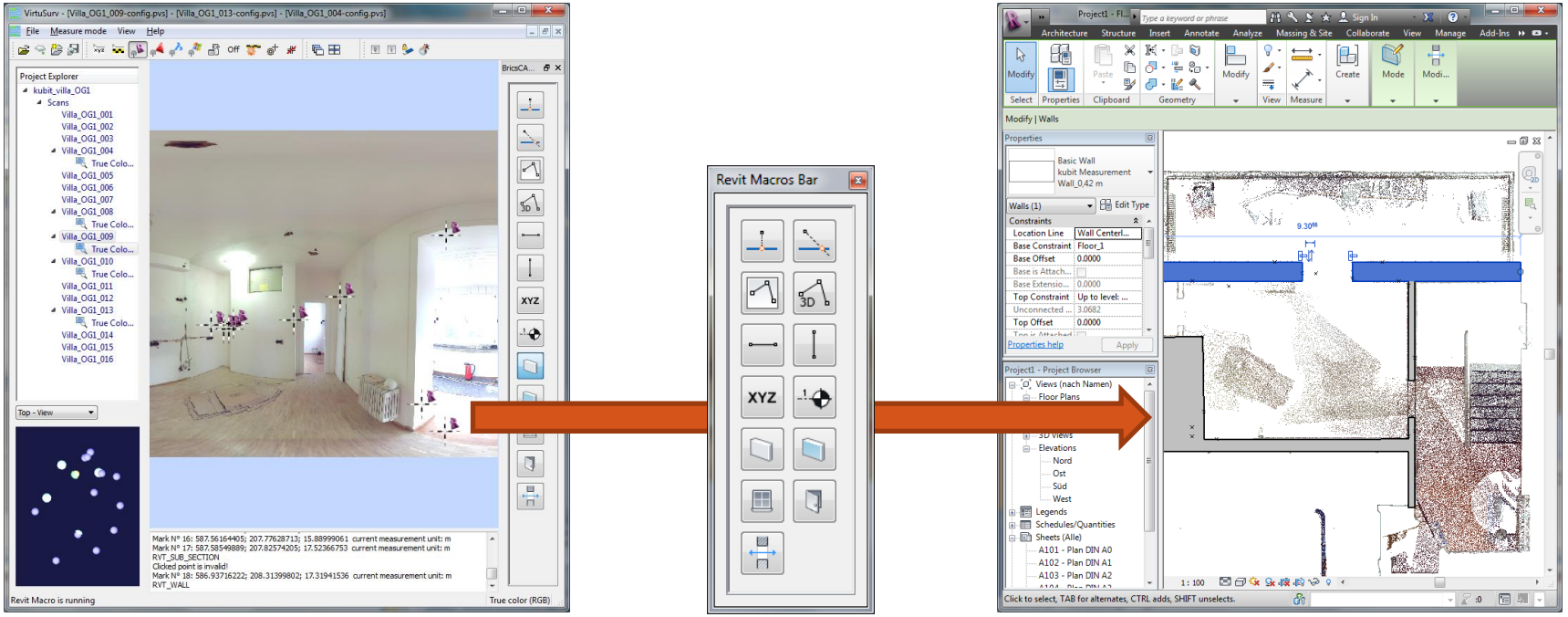
Revit point cloud link

1. Create a Revit point cloud and a VirtuSurv project from the same registered scan project
2. Link the Revit point cloud to the VirtuSurv project



Revit point cloud link

3. Move and rotate the Revit point cloud to the position you need
4. Use VirtuSurv with the new point cloud position



What can we expect in the future?

Precision

Reality **Point cloud**

- Collision analysis
- Deformation analysis
- Workthroughs

3d models
solids / meshes

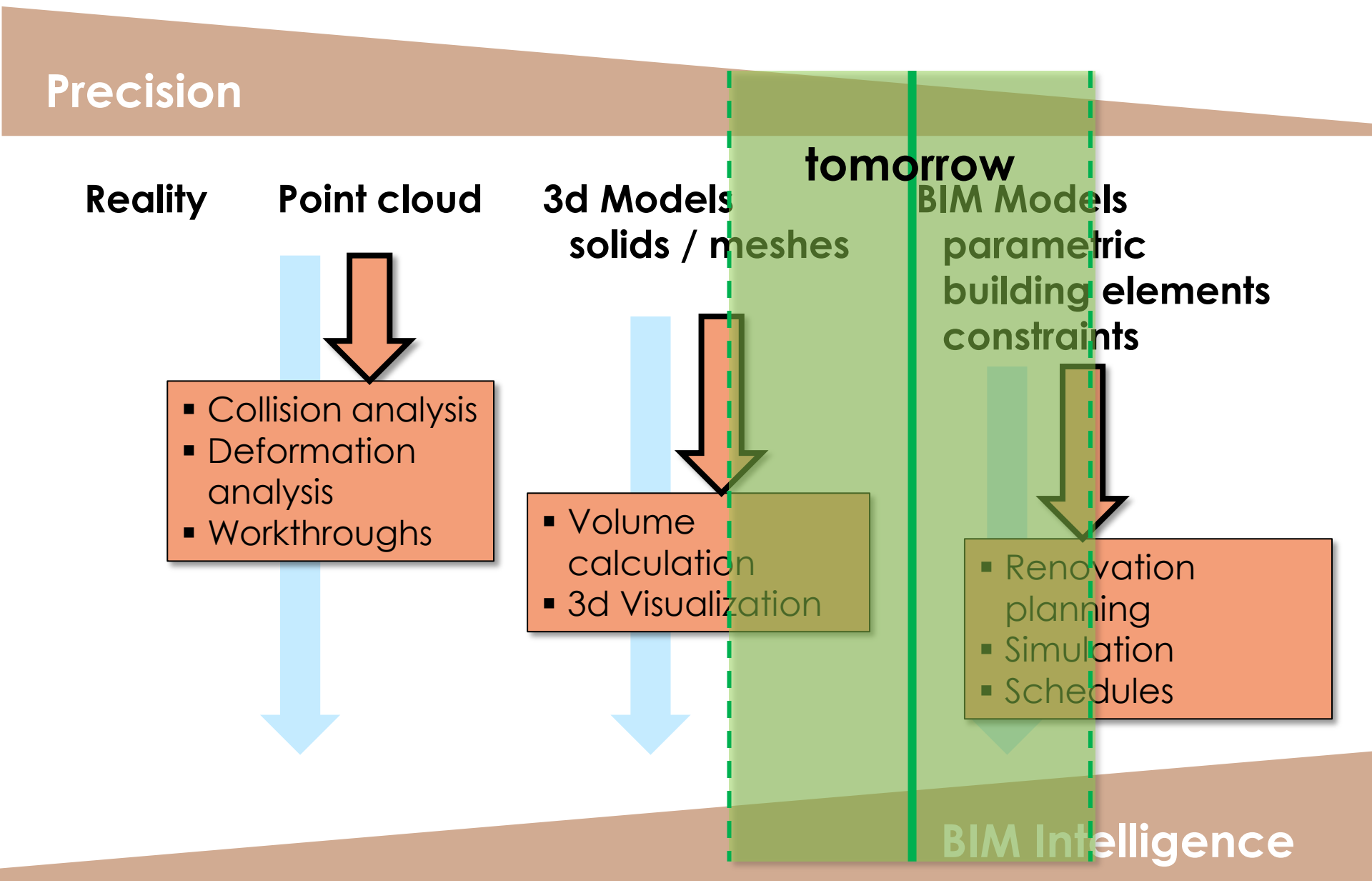
- Volume calculation
- 3d visualization

BIM Models
parametric building elements
constraints

- Renovation planning
- Simulation
- Schedules

BIM Intelligence

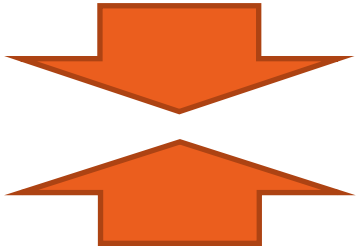
What can we expect in the future?



What can we expect in the future?

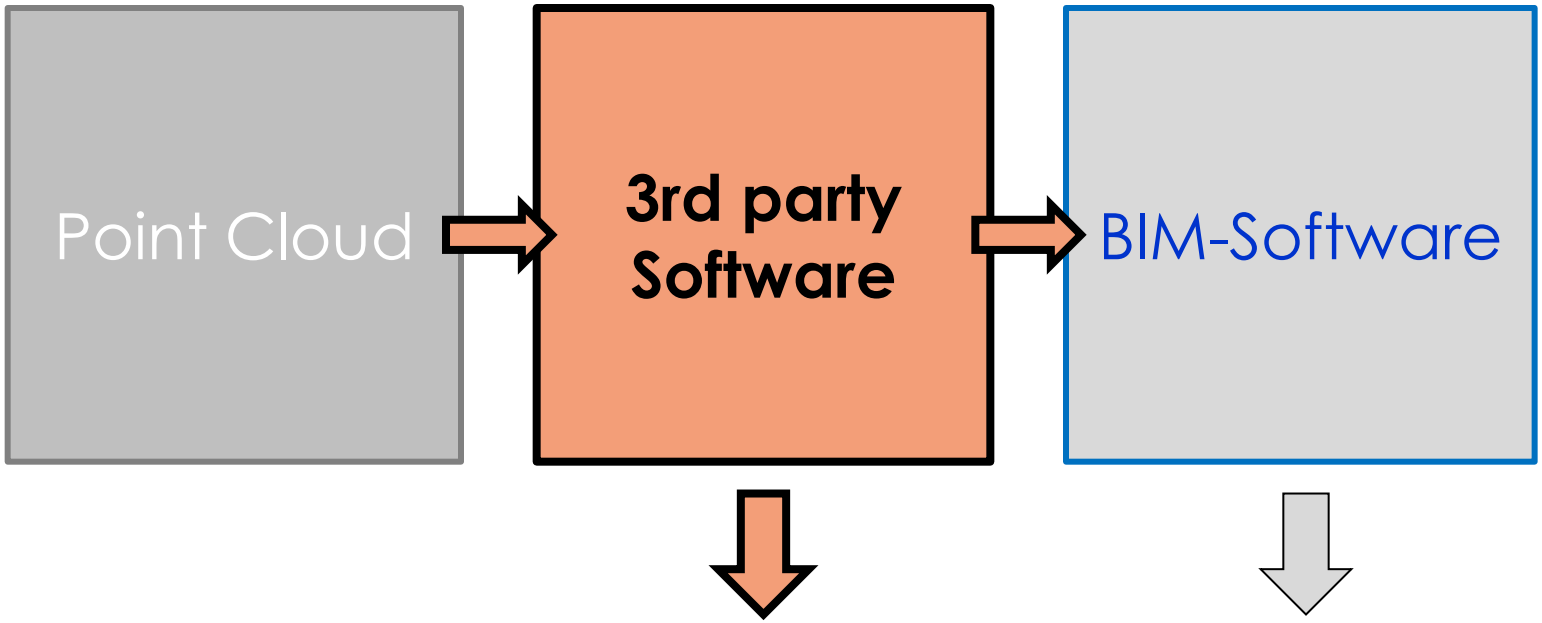
Tasks for the future:

1. Automatic recognition of building elements in point clouds
   - Precise shape and position of 3D building elements



2. Consideration of design conditions
   - Orthogonal wall axes
   - Minimal number of differnt building element types
   - Compliance of wall alignment

What can we expect in the future?



Must take into account certain design constraints

- Visualization
- Renovation planning
- Simulation
- Schedules


Thank You! Terima Kasih!
Questions?
www.kubit-software.com